ILMOR MARINE

Please read this Owner's Manual completely prior to operating the engine and boat for the first time. The Owner's Manual contains information critical for safe operation, and to activate and keep the limited warranty statement in effect throughout the applicable warranty period. Continuing the appropriate maintenance and care going forward can ensure long-term enjoyment of the MV8 engine. DO NOT OPERATE THE ENGINE WITHOUT FIRST READING THE ENTIRE MV8 OWNER'S MANUAL AND ALL SUPPORTING DOCUMENTATION, AS WELL AS THE BOAT OWNER'S MANUAL.

WELCOME

ILMOR Marine, LLC, is pleased to welcome you to boating enjoyment available only through use of the extraordinary MV8 engine. ILMOR is a recognized leader in the marine industry, having originated through championship-caliber, high-performance engines. Our experience inevitably led to the development of the MV8, offering 5.7, 6.0, 6.2 and 7.4 liter versions, which provide the appropriate power range for ideal wakeboarding at 18 miles per hour, and with equal execution when skiing at 30 mph. We didn't leave out the simple joy of skimming across the surface from 10 mph to 45 mph with the same level of quality performance. The MV8 provides the kind of horsepower necessary to plane with pulse-pounding quickness while equally ensuring the reliability and smoothness necessary for just-above-idle investigation of interesting coves and shorelines. It's all here.

The MV8's heritage extends back to the company's founding in 1983, when Swiss-born Mario Illien and British native Paul Morgan sent a handwritten letter to American businessman and team owner Roger Penske. The duo proposed a new company that would design and build turbocharged engines for race cars. Penske was intrigued and within three months ILMOR Engineering was born.

Working with various international companies over the years, ILMOR has enjoyed unparalleled success in many forms of racing, particularly Formula 1 and Indy Car racing. In fact, partnered with Honda, ILMOR is currently the sole provider of engines to the Indy Car circuit.

Since 2004, ILMOR's marine division has enjoyed substantial growth, becoming a well-established supplier in the U.S. and European high-performance boat market. In addition to the MV-550 V-10 engine, ILMOR has added two more packages: the MV-625 in 2005, and the MV-710 in 2006. The 700-horsepower, naturally-aspirated marine engine was developed with significantly improved fuel efficiency and a light-weight package, factors that would add to the superiority of the MV8 in its development stage.

In 2009, ILMOR had to utilize its substantial engineering expertise to create an entirely new generation of MV-10 marine products. Emissions requirements established by the California EPA (the most stringent in the U.S.) and the federal Environmental Protection Agency meant that all high-performance marine engines had to meet tough new exhaust emissions standards. The MV-650 and the MV-725, along with state-of-the-art ILMOR elec-

tronics and the all-new INDY® high-performance stern-drive were created to not only meet but exceed every requirement of the new regulations.

In the first year of competition for the engines, a pair of ILMOR Marine MV-10 625 engines powered the #99 Fountain Powerboat King of Shaves to win the coveted 2007 Powerboat P1 Evolution Class World Championship. The successful first year of competition was backed up in 2008 with World Championship wins in both the largely European-based Powerboat P1 series and the U.S.-based APBA P1 race series, and repeating in 2009 as Powerboat P1 champion.

All of this rapid development with a genuinely measured success has ensured that when ILMOR created the MV8, the engine would do exactly what it should do, right from the start. Everyone knows that creating horsepower is easy. Creating horsepower output in the correct range for the correct application, however, is a challenge to which ILMOR was more than equal. You are about to benefit from this knowledge and experience.

This Owner's Manual reflects the most recent product information available at press printing. Nonetheless, ILMOR retains the right to make changes to the engine and/or components as a result of continually improving the MV8. ILMOR reserves the right to make changes to the engine specifications at any time, without prior notice, and to discontinue product. Changes may be made without obligation on ILMOR's part to provide or equip previously manufactured engines with updated specifications. If the retail purchaser determines that updated equipment can be retrofitted on existing product, such changes are at the sole discretion and cost to the retail purchaser. ILMOR bears no responsibility in these instances. Consumers are encouraged to check www.ILMORMARINE.com regularly for additional information. The website will also track service bulletins and other technical information that may have impact on the consumer's engine operation. ILMOR's obligation regarding such matters is delineated within the ILMOR Limited Warranty Statement, found within this Owner's Manual.

Because of ILMOR's commitment to continual product improvement, some alterations may occur to the current model MV8 after the publication of this Owner's Manual. Realistically, this Owner's Manual also cannot address every potential issue that may arise from the operation and use of the MV8. A reasonable effort was made to make this Owner's Manual as accurate and complete as possible, but photographs and drawings may be only representational. Suppliers may also change or alter product. The information provided discusses the topics and issues most critical to ensuring a successful, long-term ownership of the MV8 engine.

Most questions and discussions about the MV8 are best directed to your authorized ILMOR dealer. However, it may be necessary or desirable to contact ILMOR directly. Please forward inquiries to the following:

ILMOR Marine, LLC
186 Penske Way
Mooresville, NC 28115
(704) 360-1900
Fax (704) 360-1901
Online contact: sales@ilmormarine.com
Product updates and technical bulletins: www.ilmormarine.com

ILMOR Marine would like to express appreciation to MasterCraft Boat Company for the loan of many photos that appear within this manual.

DANGERS, WARNINGS & CAUTIONS

Throughout this manual the terms "Danger," "Warning," and "Caution" appear, alerting the boat owner and/or operator to dangerous or potentially dangerous situations that may arise. Those terms have the following respective meanings whenever they appear herein:

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

DANGER

WARNING

CAUTION

CAUTION

Failure to adhere to and comply with the safety dangers, warnings and cautions that appear in this manual can lead to serious illness, injury or even death and/or damage to your boat or the property of others. Beyond these warnings, boaters have a personal responsibility to utilize a common sense approach to the boating experience, including keeping individuals off or near the swim platform and the stern area of the boat during the engine operation. Personal flotation devices ("PFDs") save lives and ensure positive experiences. **ILMOR offers many proactive approaches to the boating experience, but the consumer is ultimately responsible for the positive and safe involvement in boating.**

Be sure to review the *Safety* section of this manual, which immediately follows the *Table of Contents* section. Because of the importance of these dangers, warnings and cautions, they are reprinted here, along with the pages on which you will find them. Please note that the safety information statements presented below are categorized for information purposes only, and are not presented in any particular order of importance. Each of the statements referenced below and in the other sections of this manual provide you with important safety-related information and must be read and followed to avoid injury or damage, as applicable. We strongly encourage you to cross-reference and read the dangers, warnings and cautions within the context in which they are presented by reading and reviewing those sections.

DANGER

Care must be taken to avoid exposure to carbon monoxide, even in small concentration. Avoid exhaust areas and the engine compartment during the venting of engine exhaust. Carbon monoxide is colorless, odorless and poisonous, and can cause serious injury or death in short periods of time! *(Page 2)*

Gasoline is explosive. If a gasoline odor is present or if gasoline can be seen at any point along the fuel line, the fuel tank, in the bilge or at the engine, DO NOT START THE ENGINE! Remove the key from the ignition switch and call an authorized boat and/or ILMOR dealer for service. Take care not to spill gasoline when fueling. If gas is spilled accidentally, wipe up all traces with dry rags immediately and dispose of properly on-shore. *(Page 11)*

Operate the bilge blower for at least four (4) minutes before starting the engine, and always when at idle or slow-running speed. Explosive gasoline and/or battery fumes may be in the engine compartment. Failure to operate the bilge blower as directed may result in explosion or fire, resulting in serious injury or death. Always, before starting the engine, open the engine compartment and check for fumes, leaks or the presence of fluids in the bilge. *(Page 24)*

WARNING

The engine compartment serves as a machinery guard. The engine must be OFF whenever the compartment is opened, except as directed by the boat manufacturer to vent exhaust fumes or during maintenance. Use extreme care whenever operating the engine with the compartment open. Clothing or body parts can get caught in moving parts, which could result in serious injury or death. Keep away from rotating parts. Never attempt to stop or slow rotating parts. *(Page 2)*

Use only genuine ILMOR Marine, LLC, replacement parts intended for the MV8 engine. Many of the electrical and ignition components have been designed to comply with U. S. Coast Guard regulations intended to minimize the possibility of fire and/or explosion. The use of non-approved replacement parts from aftermarket or other sources could result in fire and/or explosion. This is not covered under warranty. *(Page 2)*

In the event that the fuel system supplying the MV8 engine requires attention, any adjustment or replacement must be done by an authorized ILMOR dealer as the lines are pressurized and can be disconnected only with specialized tools. Replacement of any part of the fuel system must be with ILMOR-authorized parts only. Failure to follow this directive can result in damage to the boat, which is not covered by the warranty, and/or serious injury or death. *(Page 6)*

Any time the engine is running, an adequate amount of water as defined by ILMOR Marine MUST be flowing through the cooling system. This requires the boat to be in an operational-sized body of water or hooked up to the suction side of a raw water pump via an ILMOR-approved, water supply in a dealership. If the engine operates without water in the cooling system, in very short order the exhaust system will overheat and could potentially create an on-board fire. The raw water pump impeller, which operates only with water flow, will also fail. Damage caused to the boat under these circumstances is not covered under warranty and could result in serious injury and/or death. *(Page 6)*

When connecting the battery cable, always connect the positive (+) battery cable first. After the positive cable is connected, then the negative (-) battery cable can be attached. This minimizes the possibility of electrical contact. Always disconnect the negative battery cable first before disconnecting the positive battery cable. *(Page 8)*

Do not realign the wiring or in any way alter the wiring of the MV8 engine. Doing so may result in damage to the engine, which is not covered under warranty, and sufficient voltage may be present to cause serious injury and/or death. *(Page 9)*

Careful inspection of the entire fuel system for leaks and/or deterioration must be part of the maintenance of the engines prior to each outing. This inspection becomes even more critical after substantial periods of non-use or storage. Be certain the inspection includes the fuel tank, fuel lines, fuel pump, regulator, fuel rails, carbon canisters and all fittings in the system. Any component that shows even slight signs of corrosion, leakage, deterioration, swelling, hardening or softening should be brought to the attention of an authorized ILMOR and/or boat manufacturer's dealer for replacement prior to using the boat. *(Page 11)*

Battery electrolyte fluid is dangerous. It contains sulfuric acid, which is poisonous, corrosive and caustic. If electrolyte is spilled or placed on any part of the human body, immediately flush the area with large amounts of clean water and seek medical aid. *(Page 17)*

When charging, batteries generate small amounts of dangerous hydrogen gas. This gas is highly explosive. Keep all sparks, flames and smoking well away from the area. Failure to follow instructions when charging a battery can cause an electrical charge or even an explosion of the battery. This could result in serious injury or death. *(Page 17)*

When charging, batteries generate small amounts of dangerous hydrogen gas. This gas is highly explosive. Keep all sparks, flames and smoking well away from the area. Failure to follow instructions when charging a battery can cause an electrical charge or even an explosion of the battery. This could result in serious injury or death. *(Page 19)*

Any time the engine is running, an adequate amount of water as defined by ILMOR Marine MUST be flowing through the cooling system. This requires the boat to be in an operational-sized body of water or hooked up to the suction side of a raw water pump via an ILMOR-approved, water supply in a dealership. If the engine operates without water in the cooling system, in very short order the exhaust system will overheat and could potentially create an on-board fire. The raw water pump impeller, which operates only with water flow, will also fail. Damage caused to the boat under these circumstances is not covered under warranty and could result in serious injury and/or death. *(Page 25)*

Completely filling the fuel tank prior to storage and then sealing the fuel tank vent does not allow room for necessary expansion. This can result, in extreme conditions, in fuel tank rupture. Such release of fuel into the boat and potentially into the storage area could result in substantial damage to the boat and contact with any spark (such as a flame-producing pilot light in a heater) could also result in property damage and serious injury or death. *(Page 38)*

CAUTION

Excessive exhaust temperatures will damage the exhaust hose and are symptomatic of a leak or restriction in the cooling system. The engine should be shut OFF immediately in the presence of too much heat, whether by odor, touch or sight. Failure to do so may result in more serious consequences, including but not limited to, damage to the engine, which is not covered under warranty, and/or damage to the boat that may result in personal injury as well. *(Page 5)*

Always be certain that there is ample room around the boat when trying to start the engine in forward position as the boat will move forward when the engine starts. Contact with other boats, docks, shallow waterway bottoms, or debris may result in damage to the boat that is not covered under warranty, and may also result in serious injury. *(Page 26)*

CAUTION

Boats are equipped with a variety of audible and visual alarms that alert operators to potential performance issues. No alarm, whether it sounds an alert or provides information on the gauges, should ever be ignored. The drive train's sensors are often the earliest indication of problems that, if ignored, may result in serious damage to the equipment. This is not covered under warranty. *(Page 10)*

Damage to the engine by use of low-quality gasoline or gasoline with an octane rating below the minimum level listed for ILMOR MV8 engines will void the warranty on the engine. *(Page 12)*

Extended storage with fuel in the system can affect fuel stability and may require system inspection and fuel filter replacement when the boat returns to service. *(Page 12)*

Damage to the engine by use of low-quality or non-specified oil as listed for ILMOR MV8 engines will void the warranty on the engine. *(Page 13)*

Damage to the engine by use of low-quality or non-specified transmission fluid/oil as listed for V-Drive and direct drive transmissions will void the warranty. Overfill or underfill may also result in serious damage to the engine and is not covered under warranty. *(Page 13)*

Ignoring elevated temperatures on a temperature gauge or any other evidence of the engine operating at temperatures above recommended levels can result in serious damage to the engine. Any resulting damage will not be covered by the warranty. *(Page 14)*

Failure to maintain your coolant at the proper level will cause potentially serious engine damage. The warranty does not cover engine damage due to overheating or any other cause associated with improper coolant levels. *(Page 16)*

Add-on equipment may adversely affect the alternator output or overload the electrical system. Any damage caused as a result will not be covered by the warranty. *(Page 17)*

Failure to follow the break-in and operating procedures as described in this Owner's Manual will void the warranty. Before operating the boat for the first time, you must read this Owner's Manual completely, as well as the boat manufacturer's Owner's Manual. (Page 23)

Boat owners should not remove the factory break-in oil until after a minimum of ten (10) hours proper operation, but not later than twenty-five (25) hours. At that time, an oil change should be performed by an authorized ILMOR dealer, who will be able to "read" the oil and filter to determine if the proper break-in of the engine components appears to be occurring. *(Page 23)*

Failure to follow the engine oil recommendations listed in the manual can cause accelerated engine wear and could result in component failure. Damage to the engine due to incorrect oil usage, oil changes and correct levels may void the warranty. *(Page 24)*

Never operate the starter motor continuously for more than fifteen (15) seconds without at least two (2) minute resting intervals. Failure to do so may result in the starter overheating, which is damage not covered under warranty. The ignition key must be released after the engine has started to avoid damage to the starter motor and drive. *(Page 26)*

When moving between forward-neutral-reverse or any combination of gear settings, always all the engine to fall to idle (600-800 RPM) before completing the shift. Failure to do so may result in damage that is not covered under warranty. *(Page 26)*

Failure to follow the engine oil recommendation listed in this Owner's Manual can result in exaggerated engine wear and increase the possibility of engine component failure. Damage to your engine due to failure to follow engine oil procedures can be costly to repair and is not covered under warranty. *(Page 30)*

Ignoring elevated temperatures on a temperature gauge or any other evidence of the engine operating at temperatures above recommended levels can result in serious damage to the engine. Any resulting damage will not be covered by the warranty. *(Page 33)*

Exposure to salt water causes corrosion, leading to significant damage to metal, including stainless steel and chrome. If evidence of corrosion shows on the boat, the engine and transmission should be carefully cleaned with fresh water and a mild soap solution after use in salt water. A protective marine oil may be applied to exposure metal to halt the acceleration of corrosion. Failure to pay attention to corrosion matters will void the warranty. *(Page 36)*

Damage due to improper storage and/or winterization preparations is not covered under warranty. Owners are encouraged to seek assistance from an authorized ILMOR dealer to properly prepare the drive train for periods of inactivity exceeding two (2) weeks. *(Page 37)*

Fuel systems on all boats equipped with ILMOR MV-8 engines MUST be properly prepared for storage periods exceeding two (2) weeks, as outlined in this Owner's Manual. Failure to do so will void the warranty. *(Page 38)*

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SAFETY

Safety is paramount to ILMOR. Every reasonable effort has been made to provide directions to safe and thoughtful use of the ILMOR product. In most instances, adherence to common sense when operating or working around the engine will present the boat operator, all on board and other boaters on the same body of water, the proper atmosphere in which to safely enjoy the experience.

Prior to operating the boat for the first time, boat operators MUST read this Owner's Manual in its entirety. It is also recommended to re-read it prior to the first outing each boating season. Keeping the Owner's Manual on-board the boat in a dry, secure location such as a glove box, is highly recommended for referral purposes. Be sure to also read the boat Owner's Manual, with particular attention to proper operation and safety concerns addressed within that publication.

It is the boat owner's and the operator's responsibility to be aware of safety issues and concerns in the proper operation of the boat. All people on-board, regardless of age, physical limitations and/or previous boating experience (or lack of experience), bear responsibility for determining the appropriate behavior and safety precautions, including care around the engine, engine box, transmission and all moving parts.

Key to safety is the prescribed maintenance of the engine and drive train as described in this Owner's Manual, on www.ILMORMARINE.com, and through information and directives provided by the suppliers of parts for the drive train. A properly prepared and maintained engine is less likely to stall, misfire or otherwise operate in a manner that could place the boat occupants, as well as others on the same body of water, in unsafe situations.

Throughout the MV8 Owner's Manual, specific safety information will be highlighted with symbols designed to draw particular attention to specific information. These will include:

The safety alert symbol, is used to alert to potential personal injury hazards. Obey all safety messages that following this symbol to avoid possible injury or death.

DANGER

DANGER indicates an imminently hazardous situation that will result in death or serious injury if not avoided.

WARNING

WARNING indicates a potentially hazardous situation that could result in death or serious injury if not avoided.

CAUTION

CAUTION indicates a potentially hazardous situation that may result in minor or moderate injury if not avoided.

CAUTION

CAUTION used without the safety alert symbol indicates a potentially hazardous situation that may result in property damage if not avoided.

The precautions listed in this Owner's Manual are not all-inclusive. ILMOR cannot anticipate any or all safety issues, nor fully anticipate the extent to which injury may occur. Information contained in this Owner's Manual reflects a consensus of opinion within the marine industry.

Direct Safety Concerns

Whenever an MV8 engine is operated within the confines of an engine compartment, it is extremely important to follow the boat manufacturer's instructions regarding venting of the engine compartment prior to or during low-speed/idle operation. Exhaust fumes may build up inside the engine box, which can, and has, resulted in explosions.

One of the most critical safety matters affecting boaters is the matter of carbon monoxide emission. This is a colorless, odorless and poisonous gas that accumulates rapidly, both within confined areas and even within the open air. Exposure to carbon monoxide can be fatal within minutes, even in low concentrations. Avoid exhaust vent areas of the boat, particularly during slow-speed operation.

Care must be taken to avoid exposure to carbon monoxide, even in small concentration. Avoid exhaust areas and the engine compartment during the venting of engine exhaust. Carbon monoxide is colorless, odorless and poisonous, and can cause serious injury or death in short periods of time!

DANGER

All persons on-board must exhibit special care and concern whenever the engine is running and the engine compartment is open. Everyone should avoid all moving parts. If the engine or anything accessible from the engine compartment requires adjustment while the engine is running, the adjustment should be done by an authorized ILMOR dealer or authorized boat manufacturer dealer if at all possible. If adjustments are necessary while the boat is underway or in preparation for boating, extreme care should be used.

The engine compartment serves as a machinery guard. The engine must be OFF whenever the compartment is opened, except as directed by the boat manufacturer to vent exhaust fumes or during maintenance. Use extreme care whenever operating the engine with the compartment open. Clothing or body parts can get caught in moving parts, which could result in serious injury or death. Keep away from rotating parts. Never attempt to stop or slow rotating parts.

WARNING

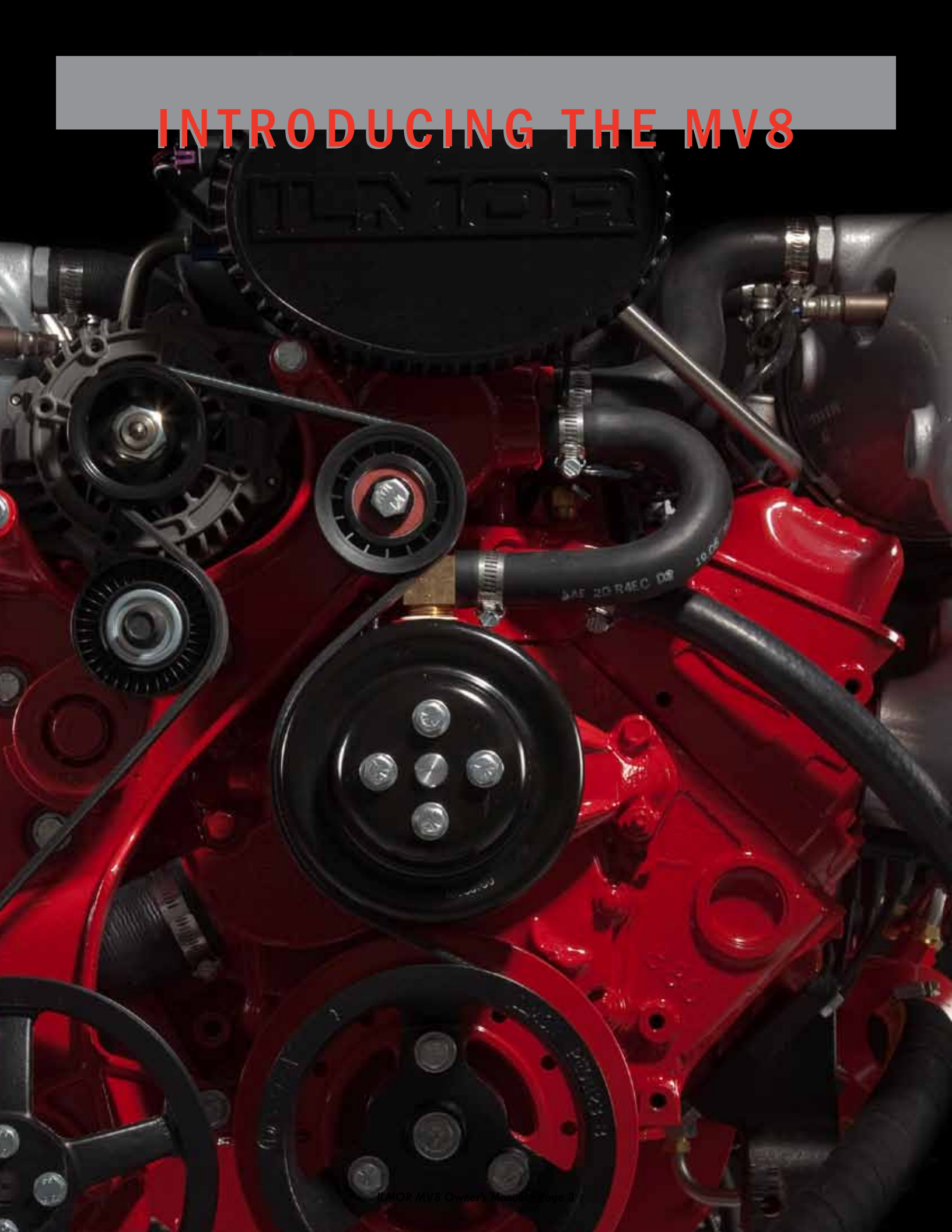
It is the owner's and/or operator's responsibility to perform all safety checks to the engine(s) prior to, during and after operating the boat. When properly adhered to, the maintenance schedules listed in this Owner's Manual will ensure long-term operation and performance of the engine. When service and maintenance are required, return the boat to an authorized ILMOR dealer. Failure to follow procedures outlined in this Owner's Manual or through published technical information at www.imormarine.com may void the warranty.

The precautions listed in this Owner's Manual, as well as published technical information are not all-inclusive. Any replacement part, fluid or substance that is not specified as recommended should not be used as it may result in engine failure. This could lead to voiding the warranty, as well as placing people in an unsafe situation.

Use only genuine ILMOR Marine, LLC, replacement parts intended for the MV8 engine. Many of the electrical and ignition components have been designed to comply with U. S. Coast Guard regulations intended to minimize the possibility of fire and/or explosion. The use of non-approved replacement parts from aftermarket or other sources could result in fire and/or explosion. This is not covered under warranty.

WARNING

INTRODUCING THE MV8



IGNITION COIL AND
REAR ACCESSORY BRACKET

NEUTRAL SAFETY SWITCH
AT TRANSMISSION

THERMOSTAT LOCATION

CRANKSHAFT DAMPER

EXHAUST MANIFOLD
DRAIN PLUG

ENGINE CONTROL MODULE

ENGINE OIL
FILTER LOCATION

ENGINE O2 SENSOR

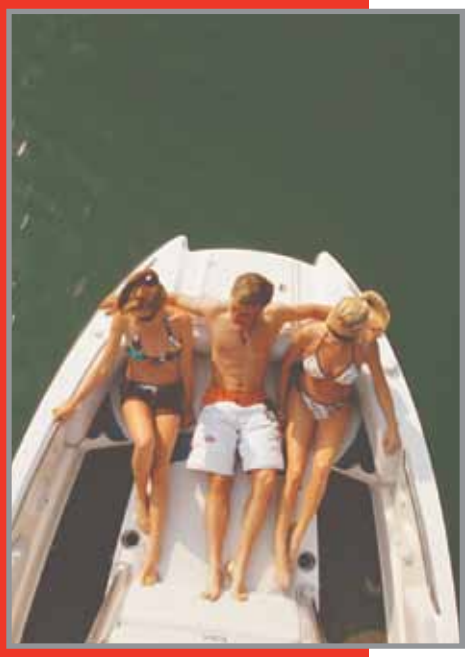
EXHAUST SYSTEM

ILMOR MV8 engines are equipped with "wet" marine exhaust systems. In a wet marine exhaust system, raw water enters the exhaust elbows (also referred to as "downturn adapters"), where it mixes with the exhaust gases. The mixing of the water and exhaust gases is important because it provides cooling to the rubber hose that connects the exhaust elbow to the muffler. After the water-exhaust gas mixture passes through the mufflers it exits back into the body of water.

Water-exhaust gas mixture temperatures will be less than 250 F. (121 C.) If the temperatures are greater than that, the rubber exhaust hose will burn. If the hose has an odor of burning rubber, immediately shut down the engine. Check for leaks or restrictions in the cooling system.

⚠ CAUTION

Excessive exhaust temperatures will damage the exhaust hose and are symptomatic of a leak or restriction in the cooling system. The engine should be shut OFF immediately in the presence of too much heat, whether by odor, touch or sight. Failure to do so may result in more serious consequences, including but not limited to, damage to the engine, which is not covered under warranty, and/or damage to the boat that may result in personal injury as well.



The exhaust manifolds are water-cooled. Water temperatures in the exhaust manifolds range from 158 F. to 194 F. (70 C. to 90 C.) The ILMOR exhaust manifold water temperatures are approximately 50-66 per cent warmer than exhaust manifolds on engines without catalytic converters. If the engine exhaust manifold temperature reaches 199 F. (93 C.) in an open cooled engine or 239 F. (115 C.) in a closed cooled engine, the system is malfunctioning, and as with the situation involving the hoses explained above, the engine should be shut OFF. Check the cooling system for leaks or restrictions. It will not be unlikely that overheating will affect both the manifolds and hoses, as a symptom of cooling system problems.

The MV8 exhaust hose meets SAE J2006 and ABYC Standards. These hoses function properly in conditions up to 250 F. (121 C.)

ILMOR engines are equipped with a catalytic converter system. This allows ILMOR marine engines to earn a Four-Star emissions rating and comply with the California Air Research Board (CARB) rules. The catalyst bricks are press fit into one-piece exhaust manifolds. If needed, the catalyst bricks can be removed and replaced within the original exhaust header. However, a special tool is needed to remove the catalyst brick and install a new one. ILMOR strongly recommends that this function be performed by an authorized ILMOR dealer.

See additional important information in the *Emissions* chapter of this Owner's Manual.

FUEL SYSTEM

ILMOR's MV8 engines are equipped with multi-port sequential fuel injection system, the most up-to-date system available in the industry, featuring E-Controls engine controller that is capable of meeting all emission, with On-Board Diagnostics Marine (OBD-M) and driveability requirements of marine applications.

All fuel system lines and connections must meet the requirements of U.S. Coast Guard (USCG) regulations. This means that hoses must meet or exceed SAE Standard J1527 DEC85, and hoses used for fuel delivery must meet or exceed specification in USCG regulations, Sec. 183.540 for recreational boating. Additionally, all fuel hose must meet the 15g/m^2 limit for fuel permeation. All plumbing for the fuel system on ILMOR engines, and the boats in which ILMOR authorizes placement, meet or exceed all requirements. See also *Fueling the MV8* chapter of this Owner's Manual for additional information.

In the event that the fuel system supplying the MV8 engine requires attention, any adjustment or replacement must be done by an authorized ILMOR dealer as the lines are pressurized and can be disconnected only with specialized tools. Replacement of any part of the fuel system must be with ILMOR-authorized parts only. Failure to follow this directive can result in damage to the boat, which is not covered by the warranty, and/or serious injury or death.

WARNING

COOLING SYSTEM

Unlike automotive cooling systems that use radiators (air-to-fluid heat exchangers) for cooling, marine engines use fluid-to-fluid heat exchangers. Cooling is provided by the body of water in which the boat is operated. A raw water pump (rubber impeller pump) draws water into the boat where it is distributed to the engine, exhaust system, and heat exchangers for maintaining the engine at an acceptable heat-operating temperature range.

There are two main types of cooling systems used in ILMOR engines, one of which will be found with each engine depending upon the type selected:

1. ***Open Cooling System***
(Raw water from a body of water flows through the engine and exhaust manifolds.)

2. ***Full-Closed System***
(Engine coolant flows through the engine and exhaust manifolds.)

Any time the engine is running, an adequate amount of water as defined by ILMOR Marine MUST be flowing through the cooling system. This requires the boat to be in an operational-sized body of water or hooked up to the suction side of a raw water pump via an ILMOR-approved, water supply in a dealership. If the engine operates without water in the cooling system, in very short order the exhaust system will overheat and could potentially create an on-board fire. The raw water pump impeller, which operates only with water flow, will also fail. Damage caused to the boat under these circumstances is not covered under warranty and could result in serious injury and/or death.

WARNING

Ensure that the raw water pick-up remains clear of debris at all times. Even small amounts can clog or block the pick-up, which is located beneath the boat. The raw water pick-up MUST have an uninterrupted input of water whenever the engine is running.

Important note: marine growth occurs in brackish and salt water, and even in what is referred to as "fresh" or salt-free water. Therefore, it is important to flush the boat's cooling system with fresh water after each use.

Accelerated marine growth occurs when operated in salt water. This makes it critical to flush the cooling system with fresh water after each use. This fresh water flushing can be done with the boat either in or out of the water. Instructions for accomplishing this are provided in the *After Each Use* chapter of this Owner's Manual.

Although ILMOR MV8 engines are capable of operation in salt water, if the boat will be most frequently used in salt water a closed cooling system is recommended.

Open Cooling System

The open cooling system was designed primarily for fresh water use only. Whenever the boat is operated in brackish or salt water, particular care, without fail, must be taken to flush the system with fresh water after every use. However, even if boating in salt-free, apparently clean fresh water, flushing the cooling system following use is recommended. This helps eliminate marine growth or fouling of the cooling system.

In an open cooling system, raw water is drawn into the boat by the raw water pump. (The intake is on the back of the boat where it will be submerged and can draw water continuously; the pump is located on the engine block.)

When the engine is cold, or the operating temperature remains below 170 F. (76 C.), minimal water flows through the engine and exhaust manifolds. All excess water will exit into the exhaust manifold's down-turn adapters to cool the marine rubber hoses for the wet exhaust system. Through the exhaust, the water returns to the body of water.

When the engine is warm, with an operating temperature greater than 170 F. (76 C.), the water from the raw water pump feeds the engine recirculation pump. The recirculation pump pushes water through the engine block, cylinder heads and exhaust manifolds. When the water mixes with the exhaust gases in the exhaust down-turn adapters, it then returns to the body of water.

Full Closed Cooling System

The full closed cooling system is the best application for boats operating in consistently brackish or salt water. The system provides maximum protection for the engine against corrosion, fouling and marine growth. As noted above, it is extremely important to keep the system flushed after each use.

In a full closed system raw water is drawn into the boat by the raw water pump, where it is distributed to the heat exchangers and then to the exhaust down-turn adapters before being returned to the body of water. The engine recirculation pump recirculates coolant through the engine and exhaust manifolds. Raw water never enters the engine or exhaust manifolds.

ELECTRICAL SYSTEM

The electrical system on the MV8 is a 12-volt negative ground system. As a result, it is important to keep in mind that operators must avoid reverse polarity, which could lead to extensive damage of the electronics. Any damage occurring as a result of reverse polarity will not be covered by warranty.

Reversed polarity also presents a serious shock risk. Turning off a breaker appears to remove power from the circuit because it turns off whatever is connected to that circuit. But with reversed polarity you have disconnected from ground, not from power. The circuit is live!

When connecting the battery cable, always connect the positive (+) battery cable first. After the positive cable is connected, then the negative (-) battery cable can be attached. This minimizes the possibility of electrical contact. Always disconnect the negative battery cable first before disconnecting the positive battery cable.

⚠ DANGER

The battery positive cable (+) connects at the starter motor battery post.

The battery negative (-), or ground, connects to the stud at the engine bell-housing.

The positive post of the battery is connected to the large post provided on the starter motor with marine grade single ought (1/0) starter wire and appropriate eyelet. After the connection is made, all other positive engine circuits will be connected to the battery positive from this junction. The supplied heavy rubber boot (red) must be used on the starter motor terminal to shield the terminal and prevent accidental contact.

In addition to circuit breakers in the boat that may impact the engine functionality or ancillary equipment and electronics that borrow power from the engine, the engine is also equipped with a fuse box that adds control over various electronic functions of the engine. The fuse box is mounted on the rear of each MV8 engine.

Fuse Box

Boat/Engine Interface Wiring

The electrical system of the MV8 is primarily self-contained in a pre-assembled unit. The interface with boat wiring follows established practices and conforms to regulatory guidelines. Every reasonable effort has been made to make the electrical connection simplified and straightforward. Consumers are strongly encouraged to seek assistance from authorized ILMOR dealers when dealing with electrical issues.

WARNING

Do not realign the wiring or in any way alter the wiring of the MV8 engine. Doing so may result in damage to the engine, which is not covered under warranty, and sufficient voltage may be present to cause serious injury and/or death.

ENGINE SENSORS

One of the reasons the MV8 is a reliable, well-running engine is that several sensors monitor performance any time the engine is running. Among the sensors are the throttle position, manifold absolute pressure (MAP), camshaft position, crankshaft position, coolant temperature, knock, oxygen, catalytic converter exhaust, oil pressure, oil temperature, and coil pack-to-crankshaft sensors. Because nearly all sensors are located inside sealed areas of the engine, and diagnostics are normally done utilizing highly technical and expensive tools, consumers are urged to take the boat to an authorized ILMOR dealerships for analysis if or when a malfunction is suspected.

Often issues will be brought to the consumer's attention by way of alarms. Most sensors trip alarms, whether audible or visual on the gauges. No warning should be ignored. Occasionally, a sensor will malfunction, but in most instances the sensor is correctly identifying and coding problems for analysis.

CAUTION

Boats are equipped with a variety of audible and visual alarms that alert operators to potential performance issues. No alarm, whether it sounds an alert or provides information on the gauges, should ever be ignored. The drive train's sensors are often the earliest indication of problems that, if ignored, may result in serious damage to the equipment. This is not covered under warranty.

ALARMS

Read the accompanying boat owner's manual for important information regarding alarms and gauges.

The ILMOR engine alarm system utilizes a visual alarm to indicate a condition in which any of the monitored engine parameters fall out of the nominal operating range. In all cases, the proper response to the alarm is to throttle back immediately and check the gauges to see which system is out of range. The method of alarm varies from boat model to boat model, usually by way of a centrally mounted gauge with specific engine response. In boats equipped with more than one engine, there will be separated alarms for each engine.

The alarm activation will sound if the following conditions occur:
Water temperature over 199 F. (93 C.) - Open Cooled
Water temperature over 239 F. (115 C) - Close Cooled
Low oil pressure

NOTE:The engine monitor alarm will display when the ignition is turned to the running position. The alarm will shut off momentarily. After the engine is started

the alarm will not go off again. If the alarm sounds at any other time or for any other reason, contact an authorized ILMOR dealer before re-starting the engine.

Water Temperature

The alarm appears if the engine coolant exceeds 199 F. (93 C.) in an open cooled engine or 239 F. (115 C.) in a closed cooled engine. If this occurs, return the engine or engines to idle and check the water temperature gauge on the instrument panel and the sea water pressure gauge. If the sea water pressure is normal (less than 5 psi at idle) the coolant temperature should begin to return to normal. If the temperature continues to increase, shut down the overheated engine immediately and take the boat to an authorized ILMOR dealer.

Oil Pressure

The alarm appears if the engine oil pressure falls below the recommended value for the current engine speed. If this occurs, throttle back to idle and allow the pressure to return above the 10 psi level. If the pressure continues to decrease, shut down the engine immediately. Check the engine oil level in the affected engine. If the oil level is acceptable, it indicates a different issue that should be addressed by an authorized ILMOR dealer.

FUELING THE MV8

The MV8 engine is being used in conjunction with an innovative fuel system that features a fuel pump that is mounted in a capsule installed directly in the fuel tank. This is similar to what is found in late model passenger cars and has proven through the years to be reliable while offering superior performance.

Because the system found on your boat has been developed for use specifically in a marine environment, a number of safety measures are incorporated in the entire fuel system from tank to lines to connections. **Please note that, as a result of the pressurized fuel lines, there are no user-serviceable parts.** Any service required in the fuel system must be performed by authorized service personnel only as they will have the specialized tools and replacement parts that meet the manufacturer's OEM specifications.

The fuel line that runs from the fuel tank to the engine is a special multi-layer armored line, covered in special fire retardant material call a "fire sleeve." The sleeve is bright orange for immediate identification of the line. ILMOR recommends a daily inspection to ensure that the line is not leaking. Never start the boat if there is evidence of fuel leaks or fumes.

Be certain to read carefully the boat manufacturer's Owner's Manual section on fueling for additional information and details. This is a critical component of safe and enjoyable boating.

DANGER

Gasoline is explosive. If a gasoline odor is present or if gasoline can be seen at any point along the fuel line, the fuel tank, in the bilge or at the engine, DO NOT START THE ENGINE! Remove the key from the ignition switch and call an authorized boat and/or ILMOR dealer for service. Take care not to spill gasoline when fueling. If gas is spilled accidentally, wipe up all traces with dry rags immediately and dispose of properly on-shore.

WARNING

Careful inspection of the entire fuel system for leaks and/or deterioration must be part of the maintenance of the engines prior to each outing. This inspection becomes even more critical after substantial periods of non-use or storage. Be certain the inspection includes the fuel tank, fuel lines, fuel pump, regulator, fuel rails, carbon canisters and all fittings in the system. Any component that shows even slight signs of corrosion, leakage, deterioration, swelling, hardening or softening should be brought to the attention of an authorized ILMOR and/or boat manufacturer's dealer for replacement prior to using the boat.

FUEL REQUIREMENTS

The ILMOR MV8 engine (5.7L, 6.0L, 6.2L and 7.4L) requires a minimum of 87 octane fuel. The octane number is based on the pump octane number, which is (R + M)/2, where R is the research octane number and M is the motored octane number.

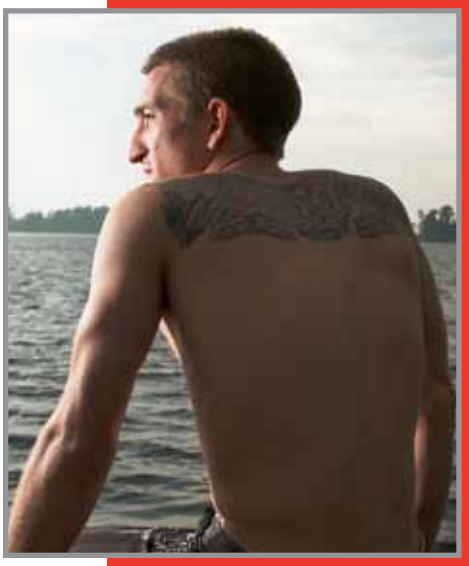
For better performance, 93 octane fuel is recommended.

Fuels other than specified will negatively alter performance, emissions and could damage the engine. Use of lower octane fuels will cause spark knock (pinging). Continued heavy

spark knock can cause severe engine damage. The engines have knock detection systems that offer the best engine performance by controlling knock through precise ignition timing. The higher octane fuel will cause less knock for the ignition system to process and adjust for.

Poor quality or old fuels can cause problems such as loss of performance, rough idling, hard starting and hesitation. If the engine experiences any of these symptoms, first try another brand of gasoline and/or replace the old gasoline with fresh gasoline.

Many engine manufacturers believe the U.S. Environmental Protection Agency's (EPA's) detergent levels in gasolines do not provide sufficient deposit controls to allow for optimal engine performance. As a result, TOP TIER Detergent Gasoline standards were created to ensure gasolines have all the necessary additives and detergents to reduce the build-up of deposits in an engine. ILMOR recommends purchasing fuel from a supplier that confirms their fuel meets TOP TIER specifications. For a list of TOP TIER retailers, check www.toptiergas.com, and click on "Retailers."



Damage to the engine by use of low-quality gasoline or gasoline with an octane rating below the minimum level listed for ILMOR MV8 engines will void the warranty on the engine.

CAUTION

Oxygenated Gasoline or Gasoline Containing Alcohol

E-85 fuels are not to be used! Use of this fuel may cause engine performance to suffer and may damage vital fuel system components.

Fuel that is no more than 15 per cent MTBE (methyl tertiary butyl ether) may be used in the MV8 engine. MTBE is an oxygenate and octane booster. MTBE is used in fuels to meet government mandates. However, because of environmental concerns MTBE is being phased out and replaced with ethanol or methanol.

Leaded fuels may NOT be used in the MV8 engine.

Gasoline containing levels higher than 10 per cent ethanol or methanol is **NOT TO BE USED** in the MV8 engine. This is primarily due to the fact that the alcohol in the fuel absorbs water. Water in the fuel can cause corrosion and extensive damage in the fuel system. If the presence of alcohol in the gasoline is unknown, frequent inspections of the fuel system are required.

When the Boat Is Not Used for A While

ILMOR recommends the use of Sta-Bil® fuel stabilizer if the boat consumes less than a tank of fuel every thirty (30) days. Today's fuels are more susceptible to degradation, and the use of a quality stabilizer helps ensure fewer problems if the boat is used only on a limited basis.

If the boat has not been run for more than thirty (30) days and fuel remains in the tank—even stabilized fuel—the engine may run with reduced performance until the existing fuel has been used. The manufacturer will not pay for repairs to components that are damaged from poor quality fuel as this is not covered under the engine warranty.

Extended storage with fuel in the system can affect fuel stability and may require system inspection and fuel filter replacement when the boat returns to service.

CAUTION

Fuels Outside the United States and Canada

If the boat is operated outside the United States or Canada, it may be more difficult to obtain lead-free fuel. As the engine components are manufactured to function properly only with unleaded gasoline, it may be necessary to search for refined unleaded gasoline.

OTHER PRE-OUTING REQUIREMENTS

ENGINE OIL

ILMOR blended synthetic 5W-30 is the recommended oil for use in the MV8 5.7L, 6.0L and 6.2L engines. Synthetic 5W-50 is required for the 7.4L engine only. Use of supplemental oil additives is not required. ILMOR blended synthetic contains all the necessary additives for the MV8.

An oil change should be scheduled following the first 25 hours of operation and every 50 hours thereafter. Oil should also be changed if the temperature for any reason has exceeded 329 F. (165 C.) Always change the oil filter every time the oil is changed, using only ILMOR-approved filters as listed in the *Maintenance* section of this Owner's Manual.

Operators should also verify the oil level prior to every operation, as indicated in the *Prior to Each Use* section of this Owner's Manual.

CAUTION

Damage to the engine by use of low-quality or non-specified oil as listed for ILMOR MV8 engines will void the warranty on the engine.

The oil capacity for all four MV8 engines is five (5) quarts during oil change.

TRANSMISSION FLUID/OIL

The V-drive and direct drive transmissions require lubrication to function properly. Your dealer can verify the type of transmission in the boat, and the amount of transmission fluid/oil varies according to the product. Fortunately, the V-drive and direct drive transmissions requires only modest attention, unless problems are suspected. If there is the presence of fluid–usually foaming or bubbling–around the connection plates or the dipstick, it indicates an overfill condition. A burnt odor from the transmission is symptomatic of potentially serious overheating issues that must be addressed by an authorized ILMOR dealer immediately.

CAUTION

Damage to the engine by use of low-quality or non-specified transmission fluid/oil as listed for the V-drive and direct drive transmissions will void the warranty. Overfill or underfill may also result in serious damage to the engine and is not covered under warranty.

See the requirements for transmission fluid/oil in the V-drive and direct drive transmissions manual.

BEFORE EACH USE

Because this process should be completed while the engine is cool (in order to avoid burns), it is recommended that this check be completed prior to starting the engine. If checking during an outing, allow the engine to cool. Be very careful to avoid burns from contact with hot engine parts.

Check the Raw Water Impeller/Sea Pump

- Ensure the engine is OFF and the engine safety starting switch is disconnected. Leave the throttle/shift control lever in neutral. Open the engine compartment and locate the raw water impeller housing. (This is also sometimes referred to as a sea pump.)

- Disconnect the intake and outflow hoses on the raw water impeller housing. Remove any debris found inside the hoses and then reconnect.

- Remove the screws on the impeller cover and very carefully break the gasket seal. Because a good seal is very important to avoid potentially serious leaks while the engine is in operation, it is advisable to have some new gaskets in the boat's glovebox for such occasions. If even a slight gap exists, you may experience problems in the future. Therefore, replacing the gasket is a better idea than taking any chances with an older one. Also, leaving any portion of the older gasket on the house or cover can impede good contact.

CAUTION

Ignoring elevated temperatures on a temperature gauge or any other evidence of the engine operating at temperatures above recommended levels can result in serious damage to the engine. Any resulting damage will not be covered by the warranty.

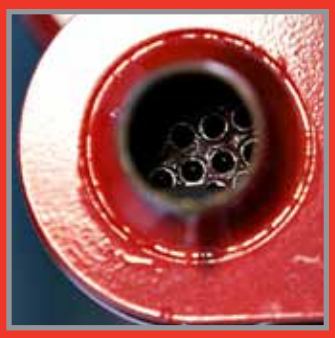
- Inspect the inside of the impeller housing. If any rubber extrusions on the end of the arm appear frayed or worn, it should be replaced. Debris entering the impeller inevitably will damage it. However, the impeller serves its purpose in deflecting debris and keeping it out of much more expensive internal engine parts.

- Any uncertainty about the condition of the impeller means that it should be removed and inspected. The impeller fits very snugly and will require some care in removing and re-installing or installing a new one. This ensures proper operation. The use of soap or water-based petroleum jelly will help with installation. Note that proper placement on the gear results in a squeeze on the arms. This is the correct installation.

- Place a gasket between the housing and the cover after ensuring that the surfaces are smooth and clean. Re-install the screws loosened when the face plate was removed earlier. Do not over-tighten the brass screws as it will cause them to break.

Important:This is a critical function of routine maintenance. Even clean-appearing waterways may have debris such as pine needles or moss that can enter the cooling system and create a blockage. Failure to perform this function can result in serious overheating of the engine. Damage to the engine and/or transmission caused by overheating is not covered by warranty! Always pay attention to your temperature gauge, even if you are carefully performing this check. Failure of the raw water impeller or blockage of the transmission cooler are frequent causes of over-heating.

Check the Transmission Cooler



Because this process should be completed while the engine is cool (in order to avoid burns), it is recommended that this check be completed prior to starting the engine.

- Ensure the engine is OFF and the engine safety starting switch is disconnected. Leave the throttle/shift control lever in neutral. Open the engine compartment. The transmission cooler is located either near the top or on the side of the engine.
- Loosen the clamp surrounding the water intake hose at the back of the transmission cooler and slide off the hose.
- Check the inside for signs of debris. Even small amounts of debris must be removed to prevent the material from clogging the cooler and preventing it from functioning properly. The boat must not be operated with any foreign materials blocking the flow of water through the cooler.
- After cleaning, re-attach the hose and clamp.

Important:This is a critical function of routine maintenance. Even clean-appearing waterways may have debris such as pine needles or moss that can enter the cooling system and create a blockage against the screen. Failure to perform this function can result in serious overheating of the transmission. Damage to the engine and/or transmission caused by overheating is not covered by warranty! Always pay attention to your temperature gauge, even if you are carefully performing this check. Failures of the raw water impeller or blockage of the transmission cooler are frequent causes of over-heating.Water in the transmission oil as a result of cooler failure may also void the warranty!

Check the Coolant Level

This procedure applies on to boats equipped with full-closed cooling system. Because this process should be completed while the engine is cool (in order to avoid burns), it is recommended that this check be completed prior to starting the engine.

• Ensure the engine is OFF and the engine safety starting switch is disconnected. Leave the throttle/shift control lever in neutral. Open the engine compartment. Locate the closed cooling system tank adjacent to the engine.

• Remove the cap and check the level. Verify that the fluid is at the FILL line. (When the engine heats, the water will expand; that is the reason the tank should not be full when the engine is cold.) If the level is at or below that, add ILMOR antifreeze. Use premixed 50/50 or use a 50/50 mix of ILMOR antifreeze and distilled water. The cooling system will take between 5.8 gallons (22L) and 6.8 gallons (26L) of coolant in total.

- If the tank was completely or nearly empty, see your authorized ILMOR dealer for immediate assistance as the engine cooling system will likely require purging. This function should be completed only by a trained ILMOR service technician.

Failure to maintain your coolant at the proper level will cause potentially serious engine damage. The warranty does not cover engine damage due to overheating or any other cause associated with improper coolant levels.

CAUTION

Check the Alternator Belt for Looseness or Damage

Because this process should be completed while the engine is cool (in order to avoid burns), it is recommended that this check be completed prior to starting the engine. On engines with serpentine belt systems, however, no change is necessary. Belt tension is maintained by the automatic belt tensioner.

- Ensure the engine is OFF and the engine safety starting switch is disconnected. Leave the throttle/shift control lever in neutral. Open the engine compartment and locate the alternator belt.

- Check the alternator belt tension at the top, midway between the circulating pump pulley and the alternator pulley. The belt should be tight enough so that it will deflect no more than one-quarter to one-half inch when pressed with the thumb or finger.

Note: if the belt is too tight, excessive belt and bearing wear can occur. If the belt is too loose, slippage can occur, resulting in low alternator output and rapid belt wear.

- Too loose or too tight tension is indicative that it is time for service on the belt. This should be done by a trained ILMOR service technician.

- Check the underside of the belt that runs in contact with the pulleys. Watch for signs of excessive wear, cuts or weakness across or in the grooves. If there are any signs, have the belt replaced.

Inspect the Battery Connections and Hold-Downs

Because this process should be completed while the engine is cool (in order to avoid burns), it is recommended that this check be completed prior to starting the engine.

- Ensure the engine is OFF and the engine safety starting switch is disconnected. Leave the throttle/shift control lever in neutral. Locate the battery(ies). Batteries are placed in a variety of locations, depending upon the model. Refer to the boat manufacturer's Owner's Manual for details. In most instances, the battery(ies) will be under the observer's seat or behind one of the rear seats.

- Check that the battery post connections are clean and tight. If not, loosen and remove the negative terminal connection first. Be careful to avoid touching the positive terminal with the wrench or negative connection. Then loosen and remove the positive terminal connection. Remove the battery hold-downs

and remove the battery from the boat. Clean corrosion from the battery posts with a battery terminal cleaner. Clean the battery with a water-and-baking-soda solution. Use care to avoid allowing the solution to enter the battery vents. Rinse the battery with fresh water. Note that this is a generic cleaning method. Battery manufacturers may specify other methods of cleaning. Verify with the battery manufacturer's website the correct cleaning method before undertaking any cleaning.

WARNING

Battery electrolyte fluid is dangerous. It contains sulfuric acid, which is poisonous, corrosive and caustic. If electrolyte is spilled or placed on any part of the human body, immediately flush the area with large amounts of clean water and seek medical aid.

- Use a battery terminal cleaning brush to remove corrosion from the inside of the battery terminals. Clean the terminals with a water-and-baking-soda solution and rinse.

- Reconnect the positive terminal first, and then the negative. Tighten the terminals. Coat both terminals completely with a thin covering of marine grease to protect against water or any potentially corrosive substance. Be sure that the rubber boot covers the positive terminal completely.

Note: The MV8 engine was designed to work with the standard electronics installed in the boat. If other electrical components or accessories are added, it may change the way the fuel injection controls the engine or the overall electrical system functionality. Before adding electrical equipment, consult an authorized ILMOR dealer. If you do not, your engine may not perform properly.

CAUTION

Add-on equipment may adversely affect the alternator output or overload the electrical system. Any damage caused as a result will not be covered by the warranty.

WARNING

When charging, batteries generate small amounts of dangerous hydrogen gas. This gas is highly explosive. Keep all sparks, flames and smoking well away from the area. Failure to follow instructions when charging a battery can cause an electrical charge or even an explosion of the battery. This could result in serious injury or death.

The boat manufacturer specifies a type of marine battery with a certain level of cold-cranking amps at zero degrees Fahrenheit (0°F). Check the boat manufacturer's Owner's Manual to determine what this specification is.

Before disconnecting the battery, be sure that the ignition key and all accessories are in the OFF position. Also, take care to re-attach battery cables correctly to avoid reversed polarity, which is addressed in the Electrical System portion of the *Introducing the MV8 Engine* chapter of this Owner's Manual.

Inspect the Engine for Loose or Missing Hardware

Because this process should be completed while the engine is cool (in order to avoid burns), it is recommended that this check be completed prior to starting the engine.

- Ensure the engine is OFF and the engine safety starting switch is disconnected. Leave the throttle/shift control lever in neutral. Open the engine compartment and visually inspect the engine.

- Systematically check the entire engine for loose and missing hardware. Attempt to shake components by hand, such as the alternator and the motor mounts. If a looseness problem exists, it is important to see an authorized ILMOR dealer.

Inspect the Throttle and Shift Cables for Kinks, Wear and Interference

Because this process should be completed while the engine is cool (in order to avoid burns), it is recommended that this check be completed prior to starting the engine.

- Ensure the engine is OFF and the engine safety starting switch is disconnected. Leave the throttle/shift control lever in neutral. Open the engine compartment and locate the throttle/shift cables.

- Follow each cable back under the floorboards and feel for any kinks or wear on the outer jacket. Any sign of cable damage is cause for immediate replacement. See an authorized ILMOR dealer for assistance.

Inspect the Fuel and Exhaust Systems for Leaks

These inspections should initially be done before the engine has been started. Recognize that this is a preliminary inspection only and care should be taken throughout the boating experience to be alert for any signs of fuel or exhaust leaks.

- Ensure the engine is OFF and the engine safety starting switch is disconnected. Open the engine compartment and visually check as much of the fuel and exhaust systems as possible.

- If at any time during operation that there is an unexplained odor, or if anyone on-board shows signs of unexplained drowsiness or sleepiness, immediately shut down the engine and determine if the odor or unexplained behavior is the result of malfunctions in the fuel or exhaust systems.

Check that the Battery Is Fully Charged

As the boat is started, check all gauges but pay particular attention to the voltmeter.

When starting the engine, check that the voltmeter reads between 12.8 and 14 volts on the voltmeter. An erratic reading can be a sign of low voltage. The voltmeter is the best indication of the state of the battery. However, it is not fool-proof. While the reading will indicate that the battery is producing current, if in a previous outing there was reason to suspect a problem with the battery(ies), check with an authorized ILMOR dealer.

Many boat models are equipped with a low-voltage battery alarm. This system may also turn off accessories when the voltmeter falls to a certain pre-set level. The objective

is to allow the operator an opportunity to start the engine and permit the alternator to recharge the battery, but if the charge has fallen too low or if the battery is older or fails to hold a charge at the expected level, the boat may not start.

In the event of a dead battery, charge it with a battery charger before attempting to start the engine. Jump-starting from another boat or battery is dangerous. Charging a dead battery with the alternator on the boat will put undue stress on the alternator, and that, in turn, may cause it to fail.

WARNING

When charging, batteries generate small amounts of dangerous hydrogen gas. This gas is highly explosive. Keep all sparks, flames and smoking well away from the area. Failure to follow instructions when charging a battery can cause an electrical charge or even an explosion of the battery. This could result in serious injury or death.

Check the Transmission Fluid/Oil Level

An accurate transmission fluid/oil reading will happen only after the transmission has run long enough to thoroughly warm to 140 F. (60 C.) This should one of the last checks performed prior to an outing. Run the engine with the boat in the body of water. Run the boat for at least fifteen (15) minutes to get the transmission fluid/oil up to the required level of heat.

- After operating the engine at idle while in the water for at least five minutes or until thoroughly warmed up, turn the engine OFF and disconnect the engine safety starting switch. Be sure the throttle/shift control lever is in neutral. Open the engine compartment and locate the transmission dipstick.

Note: To prevent an incorrect reading, the transmission fluid level must be checked immediately after the engine is shut down. Transmission fluid/oil drains back into the transmission casing from the cooler and cooler lines, and the dipstick could give a false reading if not done quickly.

Different transmissions will have their own type of dipstick. The The two types used on V-drive and direct drive transmissions used in conjunction with the MV8 engine will have either a threaded or non-threaded dipstick. Those without threads expand when the handle is turned in a clockwise direction after the dipstick is inserted.

- If the dipstick and the transmission housing void are not threaded, ensure that the dipstick is fully inserted in the void prior to use. This is required for the expansion and correct operation. The dipstick has a T handle.

- If the dipstick and housing void are threaded, there will be an o-ring between the dipstick and housing void to provide the necessary seal. The handle has a fuller grip area than the T-handled, non-threaded dipstick.

- Remove the dipstick and wipe it off with a clean rag. Quickly re-insert it fully, and then immediately remove it. Check that the level is between the ADD and FULL mark on the stick.

- Add or remove fluid/oil as necessary to maintain the level as designated. **It is as important to avoid overfilling the transmission fluid/oil as it is to avoid underfilling.** Use only the recommended fluid as specified in the Service Log section of this Owner's Manual, appropriate to the correct transmission in the boat.

Check the Engine Oil Level

An accurate engine oil level reading will happen only after the engine has run long enough to thoroughly warm up to at least 140 F. (60 C.) This should one of the last checks performed prior to an outing. Run the engine with the boat in the body of water. If the transmission fluid/oil is also going to be checked, it will require running the boat for at least fifteen (15) minutes to get the transmission fluid/oil up to the required level of heat. Check the transmission fluid/oil first, immediately after shutting down the engine. As long as the engine oil is checked within a couple of minutes of shutting down, there is no need to re-start and run the engine again before checking the oil level.

After operating the engine at idle long enough to get the engine warmed to 140 F. (60 C.), turn the engine OFF and disconnect the engine safety starting switch. Open the engine compartment. The engine oil dipstick is located on the side of the engine.

Allow approximately two minutes before checking. (This is a good opportunity to check the transmission fluid while waiting.) Remove the dipstick and wipe it off on a clean rag. Insert it fully and immediately remove. Check that the oil level is between the ADD and FULL marks on the dipstick. (Oil will expand as it is heated.)

Add oil if necessary through the oil fill neck and only enough to bring oil within the two marks. Overfill may result in damage to the engine that may not be covered by the warranty. Use oil as specified in the Oil Requirements section of the *Introducing the MV8 Engine* chapter or the *Service Log* in this Owner's Manual. **DO NOT USE OIL ADDITIVES AT ANY TIME.**

AFTER EACH USE

Check Raw Water Pick-up

For all ILMOR equipped boats, a check of the raw water pick-up is necessary. Located beneath the boat, under the water line on the hull is the raw water pick-up. Even when boating on clean-appearing bodies of water, a check of this pick-up should be done after every outing to determine if there is any debris. This should be rinsed with fresh water prior to storage, even of short duration. It will be easier to clean following an outing than waiting and possibly allowing debris to dry.

Flush Raw Water/ Sea Pump System

Place a flushing device on the raw water pickup on the bottom of the hull. Turn the garden hose ON and start the engine.

- Cycle engine speed from idle to 2000 rpm in 10-second intervals, allowing the engine to reach operating temperature. The engine needs to be at its operating temperature for fifteen (15) minutes. The garden hose flow rate may need to be adjusted if engine will not warm up; it must warm up to open the thermostat, which is required for proper flushing. If the engine will not warm up, remove thermostat and flush engine with fresh water for five (5) minutes while cycling the engine speed from idle to 2000 rpm in 10-second intervals.

- Fresh water boats should be flushed when going to storage or not being used for periods in excess of one month.

- **Salt water boats should be flushed with fresh water after every use.** Boat-in-water flushing can be achieved with a flushing device. The seacock will need to be closed while supplying fresh water to the inlet of the sea pump and allowing it to circulate through the engine. The engine must reach operating temperature for a minimum of five (5) minutes to allow the thermostat to open and circulate fresh water.

Check for Leaks

Since gaseous and/or fluid leaks are more likely to be apparent at the conclusion of an outing, the operator should open the engine compartment and check for any odor or discoloring of components. Any sign of leakage should be brought to the attention of an authorized ILMOR dealer immediately!

Clean Any Residue

Normal operations will still result in a small amount of ambient fluids. If a small amount of oil or other innocuous fluids are found on the engine, transmission or within the engine compartment, wipe down the residue with a clean rag. Keeping the engine compartment pristine helps to determine if an engine develops a more significant issue later on.

STARTING, STOPPING AND NEW ENGINE BREAK-IN

CAUTION

Failure to follow the break-in and operating procedures as described in this Owner's Manual will void the warranty. Before operating the boat for the first time, you must read this Owner's Manual completely, as well as the boat manufacturer's Owner's Manual.

Proper break-in of the engine and transmission is critical to ensuring a long life for the drive train. The first twenty-five (25) hours, when properly completed, will ensure maximum performance as well. The break-in period allows the engine and transmission components to properly seat and begins the wearing process properly.

Although your ILMOR engine and V-drive and direct drive transmissions may have been lake-tested by the boat manufacturer, the break-in period is considered to have started when the retail consumer takes possession of the boat and follows the instructions provided in this Owner's Manual.

CAUTION

Boat owners should not remove the factory break-in oil until after a minimum of ten (10) hours proper operation, but not later than twenty-five (25) hours. At that time, an oil change should be performed by an authorized ILMOR dealer, who will be able to "read" the oil and filter to determine if the proper break-in of the engine components appears to be occurring.

During the break-in period, maintain the correct oil level to ensure that the internal affected components are well-lubricated. Watch the gauges on the instrument panel closely as they are the first line of defense. Well before serious damage occurs to an engine, gauges can alert the operator to circumstances that can lead to major damage.

Any abnormal vibrations or unusual noises may be symptomatic of additional problems that are not registered by gauges or alarms. Do not ignore them. Have an authorized ILMOR dealer check out anything that seems unusual. It may be a minor issue that requires a simple tightening of screws or bolts, but it may also signal serious internal issues.

Plane the boat quickly, as low speeds can place more strain on the engine operation. This does not mean to slam the throttle/shift control lever forward; rather a steady, quick hand will help achieve the goal.

Adjusting and varying engine speeds can also help the engine during break-in. Keeping the engine at a constant revolutions per minute (RPM) for more than three (3) or four (4) minutes at a time places undue stress on the rings and bearings inside the engine.

FIRST HOURS OF OPERATION

Start the engine and allow it to warm up to the normal operating temperature of 140 F. (60 C.) This will require approximately fifteen (15) minutes and should be done in the low-idle (600 to 800 rpm as measured on the tachometer) mode.

Move the throttle/shift control lever forward, smoothly and quickly, to planing speed. Then return the throttle back to a slower speed, but one that continues the plane. Vary the engine speed but do not exceed 3,000 rpm for the first hour, and carry only a light load. After the first hour, the rpm may not exceed 5,200 rpm for the 5.7L, 5,400 rpm for the 6.0L and 6.2L, or 5,800 rpm for the 7.4L engines. Reduce the throttle/shift control lever to idle (neutral) occasionally for a cool-down period.

The boat MUST be returned to the authorized ILMOR dealer for a mandatory oil change between ten (10) and twenty-five (25) hours of operation. This ensures the service staff will be able to determine whether any internal issues may be apparent.

AFTER INITIAL HOURS OF OPERATION

After the break-in and oil change have been completed, the engine may be operated more continuously at speed, but never beyond the maximum, and it is always advisable to give the engine an occasional cool-down period. For the 5.7L engine, the maximum is 5,200 rpm; for the 6.0L, the maximum is 5,400 rpm; for the 6.2L, the maximum is 5,400 rpm; and for the 7.4L, the maximum is 5,800 rpm.

Throughout the life of the engine, always allow it a warm-up period before operation. Abuse of the engine and transmission are never covered under warranty. Regular maintenance as outlined in this Owner's Manual is very important to ensuring a long, trouble-free engine life.

Subsequent oil changes should be done every 50 hours or quarterly if the boat is not used regularly. See the *Maintenance* section of this Owner's Manual for more details.

CAUTION

Failure to follow the engine oil recommendations listed in the manual can cause accelerated engine wear and could result in component failure. Damage to the engine due to incorrect oil usage, oil changes and correct levels may void the warranty.

BEFORE THE ENGINE IS STARTED

After performing all the checks and inspections outlined in this Owner's Manual, lift the engine compartment cover.

Operate the bilge blower for at least four (4) minutes with the engine compartment cover open. Leave the bilge blower ON throughout the starting process and until the boat has planed.

DANGER

Operate the bilge blower for at least four (4) minutes before starting the engine, and always when at idle or slow-running speed. Explosive gasoline and/or battery fumes may be in the engine compartment. Failure to operate the bilge blower as directed may result in explosion or fire, resulting in serious injury or death. Always, before starting the engine, open the engine compartment and check for fumes, leaks or the presence of fluids in the bilge.

Note: Always start the engine with the throttle/shift control lever in the neutral position. The boat is equipped with a neutral-start safety switch that will not allow engines to start while in gear.

The boat is likely to be equipped with sea strainer valves and seacocks. Ensure these are open prior to starting the engine.

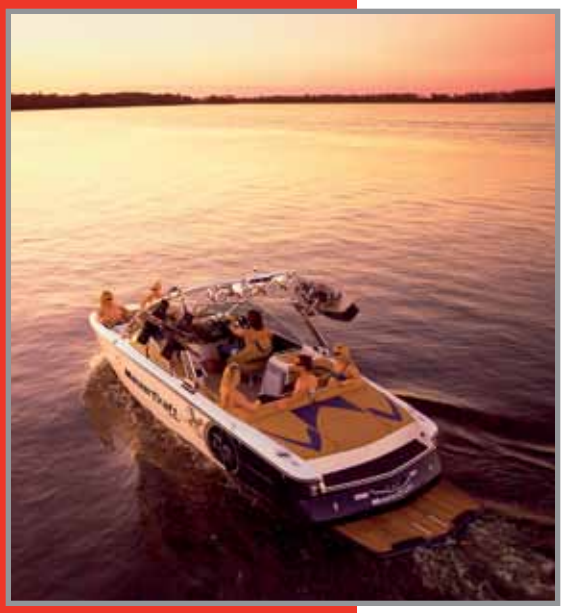
WARNING

Any time the engine is running, an adequate amount of water as defined by ILMOR Marine MUST be flowing through the cooling system. This requires the boat to be in an operational-sized body of water or hooked up to the suction side of a raw water pump via an ILMOR-approved, water supply in a dealership. If the engine operates without water in the cooling system, in very short order the exhaust system will overheat and could potentially create an on-board fire. The raw water pump impeller, which operates only with water flow, will also fail. Damage caused to the boat under these circumstances is not covered under warranty and could result in serious injury and/or death.

STARTING THE ENGINE

- ***Attach the engine safety starting switch tether*** (also known as a lanyard) between an article of the operator's clothing and the switch, which location will be identified in the boat manufacturer's Owner's Manual.

- Leave or move the throttle/shift control lever to the neutral position. This allows the electronic controls within the engine to correctly meter the fuel and air flows automatically.



- Insert the ignition key in the ignition slot and turn to the start position. Hold on for no more than three (3) to five (5) seconds per try. Release the ignition key as soon as the engine starts. If the engine does not start within ten (10) to fifteen (15) seconds total, pull out the neutral detent or push the switch on the control lever (however the boat model may be equipped) and advance the throttle to wide-open throttle. Crank the engine. When the engine fires, quickly return the throttle to the idle position to avoid over-revving the engine and/or losing control of the boat.

Note: With the electronic controls on the MV8 engine, it is unlikely that the engine will flood, but if that occurs, pull out the neutral detent or push the switch on the control lever (however the boat model may be equipped) and advance the throttle to wide-open throttle and turn ON the ignition key. When the engine fires, quickly return the throttle to the idle position to avoid over-revving the engine and/or losing control of the boat.

- Starting the engine with the throttle/shift control lever in any position other than neutral places undue strain on the entire boat and drive train. There are no circumstances under which the engine should ever be started with the lever in reverse. With the lever forward should only be used in exceptional circumstances such as those listed immediately above. Whenever the boat is started with the engine in forward, the lever must immediately be returned to neutral when the engine fires to prevent damage to the engine and to avoid losing control of the boat.

Always be certain that there is ample room around the boat when trying to start the engine in forward position as the boat will move forward when the engine starts. Contact with other boats, docks, shallow waterway bottoms, or debris may result in damage to the boat that is not covered under warranty, and may also result in serious injury.

⚠ CAUTION

Never operate the starter motor continuously for more than fifteen (15) seconds without at least two (2) minute resting intervals. Failure to do so may result in the starter overheating, which is damage not covered under warranty. The ignition key must be released after the engine has started to avoid damage to the starter motor and drive.

CAUTION

SHIFTING GEARS

- Always allow the engine to warm up to normal operating temperature of 140 F. (60 C.) prior to placing the boat in gear. Electronics will act as a governor, or rev-limiter, to prevent the boat from reaching higher rpm before the engine has warmed up. Also ensure that the engine oil pressure is greater than 10 psi, according to the gauge on the instrument panel.

- ***When shifting gears,*** always move the throttle/shift control lever smoothly and quickly into gear. Hesitations and slow gear movement can damage the shifting mechanism in the transmission. Always allow the engine speed to fall to low idle (600 to 800 RPM) before making a gear shift.

- The throttle/shift control lever must move forward forty-five (45) degrees of travel from neutral to engage forward gear. Because the lever controls both gearing and throttle response, continuing to move forward will increase speed.

- Reverse occurs when the throttle/shift control lever is pulled back from neutral at least 45 degrees of travel.

When moving between forward-neutral-reverse or any combination of gear settings, always all the engine to fall to idle (600-800 RPM) before completing the shift. Failure to do so may result in damage that is not covered under warranty.

CAUTION

STOPPING THE BOAT

This is not a land vehicle. There are no brakes to be applied. To stop a boat requires advance planning and operations that must be completed before reaching the dock or bank.

- Bring the throttle/shift control lever to neutral.

- If the boat has been operated for an extended period of time, or at high RPM, allow the engine a cool-down period at low idle (660 to 800 RPM) for several minutes.

- Turn the key to the OFF position to stop the engine and drive train.

- Coast into the dock or bank, following instructions provided by the boat manufacturer's Owner's Manual to properly stop the boat without damaging the hull.

OTHER CONSIDER-ATIONS

Never operate the boat at continuous wide-open-throttle. This places undue strain on the engine components. Wide-open-throttle exists to allow boaters to get out of dangerous encounters or situations, but it represents the upper limit of the engine's capacity.

See also the boat manufacturer's Owner's Manual for operational hints and tips that can enhance the enjoyment of the boat's and drive train's integration.

MAINTENANCE

In addition to the routine matters addressed earlier, there are a number of other maintenance matters that require periodic attention. The following table indicates the maintenance schedule:

Item	Service	First 25 hrs.	Every 50 hr.	Every 100 hr.	Every 300 hr/ Annually#	Every Two Years
Engine oil and filter	Change	X	X*			
Engine coolant	Change					X
Power steering fluid	Check					X
Transmission fluid	Change	X			X	
Serpentine belt	Inspect	X		X	X	
Raw water impeller/ sea pump	Inspect	X	X***		X***	
Air filter/flamer arrestor	Clean/ change			X		
Engine**	Tune-up				X	
Engine timing**	Check	X			X	
Spark plugs**	Replace				X	
Spark plug wires**	Inspect				X	
Breather hose**	Clean				X	
Shaft alignment	Check	X			X	
Heat exchanger(s)	Inspect/				X	
Zinc anodes	Clean Inspect		X			

#whichever comes first.
* If the engine is subject to heavy use, it is recommended to change oil and filter every 25 hours.
** Services best accomplished by an authorized ILMOR dealer.
***Replace sooner if regular checks indicate water or damage.

ILMOR recommends that the maintenance requirements be performed by an authorized ILMOR dealer. Service technicians there have the proper equipment, training and resources to best meet your service needs.

In order to thoroughly drain all the old oil, the boat engine needs to reach at least 140 F. (60 C.), which is approximately fifteen (15) minutes idle. DO NOT run the engine without it being in water. If you cannot place the boat in a body of water or do not have access to a professional off-shore hook-up (as some dealerships do) to protect the engine and drive-train components, have an authorized ILMOR dealer perform this service. If you are going to warm up the engine while on a body of water, remove it from the water and immediately perform the service, ensuring the proper draining and disposal/recycling of the old oil.

Change the Engine Oil and Filter

ILMOR blended synthetic 5W-30 is the recommended oil for use in the MV8 5.7L, 6.0L and 6.2L engines. Synthetic 5W-50 is required for the 7.4L engine only. Use of supplemental oil additives is not required. ILMOR blended synthetic contains all the necessary additives for the MV8.

- Ensure the engine is OFF and the engine safety starting switch is disconnected. Leave the throttle/shift control lever in neutral. The engine must be warm.

    - Open the engine compartment and locate the oil drain hose, which runs from the bottom of the oil pan along the port side of the engine. At the end of the oil drain hose is a brass plug.

Note: Never drain oil into the bilge or into the water. Wipe up any spilled oil immediately and dispose of the rags and drained oil in a proper manner on-shore. Many bodies of water are environmentally protected by law. Dumping in the water can result in significant fines.

- Remove the engine oil cap located on the oil fill neck. (This access to air will speed up the oil draining process.)

- Remove the bilge drain plug to drop the drain hose through the hole. Drain the oil into a container on the ground. (On some V-drive models, you will thread the line through a hole that runs through the lower edge of the transom.) Alternatively, a suction pump can be hooked up to the oil drain hose to remove the engine oil.

- Loosen the brass end cap to allow the oil to drain. Be careful to avoid rounding off the edges of the brass end cap during loosening and tightening.

- The oil filter is located at the rear of the engine. Remove the oil filter and dispose of it properly on-shore.

- Lightly lubricate the oil filter gasket and spin the new filter on until the gasket makes contact. Hand-tighten the filter one-quarter to one-half turn after contact. DO NOT use a filter wrench to tighten.

- Re-attach the oil drain plug to the end of the hose and re-fill the crankcase through the oil cap opening on the fill neck. Hand-tighten the oil cap.

- Check the oil level with the dipstick. If the oil drain hose and water lines are on the port side of the engine as it came from the factory, cable tie the lines to keep them from coming in contact with hot areas in the engine compartment.

- After the warm-up period the first time after the oil change, turn OFF the engine. Disconnect the engine safety starting switch and leave the throttle/shift control lever in neutral. Open the engine compartment cover and verify that there are no leaks around the new oil filter and fitting, the drain line or the valve covers.

- Add more oil as necessary and re-check levels if oil is added.

Failure to follow the engine oil recommendation listed in this Owner's Manual can result in exaggerated engine wear and increase the possibility of engine component failure. Damage to your engine due to failure to follow engine oil procedures can be costly to repair and is not covered under warranty.

CAUTION

Change the Transmission Fluid/Oil and Filter

In order to thoroughly drain all the old transmission fluid/oil, the boat engine needs to reach at least 140 F. (60 C.), which is approximately five (5) minutes idle). DO NOT run the engine without it being in water. *If you cannot place the boat in a body of water or do not have access to a professional off-shore hook-up (as some dealerships do) to protect the engine and drive-train components, have an authorized ILMOR dealer perform this service. If you are going to warm up the engine while on a body of water, remove it from the water and immediately perform the service, ensuring the proper draining and disposal/recycling of the old fluid/oil.*

Transmission	Model	Ratio	Capacity	Fluid Type
V-drive	631V	1.56:1	4.6 qts. (4.4L) (1.1 U.S. gal)	Automatic transmission fluid (ATF)
Direct Drive	63A	1.22:1	4 quarts	Automatic transmission fluid (ATF)
Direct Drive	45A	1.26:1	2.65 quarts	Automatic transmission fluid (ATF)
Direct Drive	45C	1.00:1	3.2 quarts	Automatic transmission fluid (ATF)

Refer to the transmission service manual for specific filter requirements.

- Ensure the engine is OFF and the engine safety starting switch is disconnected. Leave the throttle/shift control in neutral. The transmission fluid must be warmed up prior to performing this service.
- Open the engine compartment and locate the transmission, aft of the engine on direct drive models, forward of the engine on V-drives.
- Remove the transmission dipstick.
- Use a suction pump through the transmission dipstick opening to remove the fluid from the transmission casing.
- On a 1:1 transmission, the filter is located beneath the transmission housing. On a 1.5:1 transmission, the filter is accessed through a round plug on the side of the transmission housing. On a 1.26:1 transmission, the filter is accessed through a round plug on the side of the transmission housing.
- On a 1:1 transmission, remove and clean the screen. When re-installing, use and ensure that the gasket is placed correctly after replacing the filter.

Note: Access to the transmission fluid filters is somewhat difficult in the confined space in some models. Nonetheless, this maintenance is vital to long, trouble-free use of the transmission. That is why it is recommended that this service be performed by an authorized ILMOR dealer.

Clean the Engine Flame Arrestor/ Air Filter

ILMOR recommends that the flame arrestor be inspected and cleaned or replaced every 100 hours or annually, whichever comes first. Ideally, this should be done at the beginning of the boating season. During storage, material may collect inside the flame arrestor housing, whether airborne or left by small creatures.

It is extremely important to take care that while removing, replacing and while the flame arrestor is off the engine absolutely nothing foreign enters the engine through the area normally covered by the flame arrestor. Any materials entering can cause damage to your engine and will void the warranty.

Because this process should be completed while the engine is cool (in order to avoid burns), it is recommended that this check be completed prior to starting the engine.

The MV8 engine is equipped with a U.S. Coast Guard-approved flame arrestor, which is an ILMOR specific air filter. The air filter conforms to SAE J1928 and ISO 13592, which are special flame arrestor standards. Therefore, other filters cannot be used as replacements.

The purpose of the flame arrestor is to contain any backfire that may occur during engine operation. This was a much bigger issue in older, carbureted engines. It is uncommon in electronic, fuel-injected engines, but it is possible and must be addressed.

The air filter for the MV8 engine is 94PE01163.

• Ensure the engine is OFF and the engine safety starting switch is disconnected. Leave the throttle/shift control lever in neutral. The engine must be cool.

• Carefully remove the flame arrestor from the engine, using a screwdriver on the clamp screw. Take care that no foreign objects, including dust, enters the engine through the open area.

• Tap the element to dislodge any large embedded dirt and then gently brush with a soft bristle brush.

Note: DO NOT use gasoline, steam, caustic cleaning solution, strong detergent, high-pressure car wash or parts cleaning solvents. Any of these can harm the cotton filter media, as well as shrink and harden the rubber and caps.

• Either spray on ILMOR air filter cleaner or allow the air filter to soak in a pan filled with air filter cleaner. Allow the cleaner to work for approximately ten (10) minutes.

- Rinse off the filter with low-pressure water. Tap water is acceptable. Always flush from the clean side to the dirt side. This removes the dirt and does not drive it into the filter.

- Always dry naturally. After rinsing, shake off all excess water and let the element air dry.

Note: DO NOT use compressed air, open flame or heat dryers. Excess heat will shrink the cotton filter media. Compressed air will blow holes in the element.

- After cleaning the air filter always re-oil before using. Spray ILMOR air filter oil down into each pleat with one pass per pleat. Wait ten (10) minutes and re-oil any white spots still showing. Or use the oil from a squeeze bottle, down into the bottom and along each pleat with just one pass in each pleat. Let the oil wick into the cotton for twenty (20) minutes. Re-oil any white spots still showing. However, also do not over-oil or soak the filter.

Note: Never use the air filter without oil. The filter will not stop the dirt without the oil. Red dye is added to ILMOR air filter oil to assist in determining whether you have complete coverage after application. Never use automatic transmission fluid, WD-40, LPS, other lightweight oils or anything not specified for this purpose.

- Re-install. Ensure the element seats properly before tightening the clamp screw.

Replacing the Raw Water Impeller/ Sea Pump Impeller

Because this process should be completed while the engine is cool (in order to avoid burns), it is recommended that this check be completed prior to starting the engine. If checking during an outing, allow the engine to cool. Be very careful to avoid burns from contact with hot engine parts.

- Ensure the engine is OFF and the engine safety starting switch is disconnected. Leave the throttle/shift control lever in neutral. Open the engine compartment and locate the raw water impeller housing. (This is also sometimes referred to as a sea pump.)

- Disconnect the intake and outflow hoses on the raw water impeller housing. Remove any debris found inside the hoses and then reconnect.

- Remove the serpentine belt.

- Remove the screws on the impeller cover and very carefully break the gasket seal. Because a good seal is very important to avoid potentially serious leaks while the engine is in operation, it is advisable to have some new gaskets in the boat's glovebox for such occasions. If even a slight gap exists, you may experience problems in the future. Therefore, replacing the gasket is a better idea than taking any chances with an older one. Also, leaving any portion of the older gasket on the house or cover can impede good contact.

CAUTION

Ignoring elevated temperatures on a temperature gauge or any other evidence of the engine operating at temperatures above recommended levels can result in serious damage to the engine. Any resulting damage will not be covered by the warranty.

- Inspect the inside of the impeller housing. If any rubber extrusions on the end of the arm appear frayed or worn, it should be replaced. If there is not a slight bend to the paddle-wheel arms, replace it. Debris entering the impeller inevitably will damage it. However, the impeller serves its purpose in deflecting debris and keeping it out of much more expensive internal engine parts.

- Any uncertainty about the condition of the impeller means that it should be removed and inspected. The impeller fits very snugly and will require some care in removing and re-installing or installing a new one. This ensures proper operation. The use of soap or water-based petroleum jelly will help with installation. Note that proper placement on the gear results in a squeeze on the arms. This is the correct installation.

- Place a gasket between the housing and the cover are ensuring that the surfaces are smooth and clean. Re-install with the screws loosened with the face plate was removed earlier. Do not over-tighten the brass screws as it will cause them to break.

Raw Water (Sea Water) Draining and Filling

(See also the instructions for Flushing Raw Water/Sea Pump System that appears in After Each Use section immediately preceding this section of this Owner's Manual. For closed cooling systems see "Coolant Draining (Changing) and Filling," which follows immediately.)

NOTE: Filling and air bleeding is automatic when the raw water pump is operating i.e. pumping fresh water from the lake or garden hose. There is no need to leave any caps, drain plugs, or hoses open for air bleeding.

For open cooling systems:

- Drain exhaust manifolds of raw water by removing ½" NPT pipe plugs from water rails.
- Drain engine block of raw water.
  - For 5.7L applications: Remove knock sensors/drain plugs from both sides of the engine block.
  - For 6.0L, 6.2L and 7.4L applications: Remove drain plugs from both sides of engine drain hoses, drain fitting #6SS - part number 94MV8-1476; removal of drain plugs will require both an 11/16" and 5/8" size wrench.

- Drain heat exchangers of raw water.
  - Open cooled systems will have an oil/transmission heat exchanger.
    - Remove heat exchanger end caps and allow draining.
  - Closed cooled systems will have an oil/transmission and engine heat exchanger.
    - Remove heat exchanger drain plugs and allow draining.
- Reinstall exhaust manifold drain plugs, engine block drain plugs, and heat exchanger end caps/drain plugs after all the raw water has been drained. If any other components contain raw water, such as a water heater, drain them now.
- Torque knock sensor retaining nut to 15 lb-ft.

Coolant Draining (Changing Coolant) and Filling

- Remove the coolant cap to allow for an air bleed.
- Remove the exhaust header feed hoses to the thermostat to allow for an air bleed. Remove the 1 ¼" hose between the engine and heat exchanger. Allow all of the coolant to drain.
- Drain both exhaust manifolds by removing the end plugs on the bottom rail.
- Drain the cylinder block:
  - 5.7L: Remove knock sensors on both sides of block.
  - For 6.0L, 6.2L and 7.4L applications: Remove drain plugs from both sides of engine drain hoses, drain fitting #6SS - part number 94MV8-1476; removal of drain plugs will require both an 11/16" and 5/8" size wrench.
- Re-assemble all hoses and drain plugs once all coolant has drained.
- Refill cooling system with ILMOR antifreeze. Use premixed 50/50 or use a 50/50 mix of ILMOR antifreeze and distilled water. The cooling system will take between 5.8 gallons (22 L) to 6.8 gallons (26L) of coolant.
- With the coolant cap off, cycle the engine speed from idle to 2000 rpm in 10-second intervals while engine temperature is below 104 F (40C). Refill the coolant reservoir as needed.
- Install coolant cap.
- Cycle engine speed from idle to 3000rpm in 30second intervals until the coolant temperature reaches 76C (169F).
- Shut off the engine.
- Top off coolant reservoir as needed.

- Cycle engine speed from idle to 3000 rpm in 30-second intervals until the coolant temperature reaches 169 F (76C).
- Top off coolant reservoir as needed.
- Check the coolant concentration level (an anti-freeze hydrometer is recommended).
- Check coolant level after first complete warm-up and cool down cycle. Additional coolant may need to be added.

Flush Coolers

Drain heat exchangers of raw water.

- Open cooled systems will have an oil/transmission heat exchanger.
  - Remove heat exchanger drain plugs and allow draining.
- Closed cooled systems will have an oil/transmission and engine heat exchanger.
  - Remove heat exchanger drain plugs and allow draining.
- Flush fresh water through the coolers from the raw water fittings. An adapter may be needed. It is better to flush water from one end of the cooler and then from the other end. This should flush out any foreign particulates.

Replacing the Serpentine Belt

NOTE: A properly mounted serpentine belt should have a small amount of "play." Without a small amount of play, the belt will wear out well earlier than should be expected. Too much play will allow the belt to come off the pulley system. Press your thumb against the belt at several locations along the serpentine route. The belt should give no more or less than 1/8" to 1/4". When the belt is off, attention should also be given to the quality of wear of the grooves on the underside of the belt where it makes contact with the pulleys. If you are unsure of the wear pattern, check against a new belt. If there is any uncertainty, seek assistance from your authorized ILMOR dealer. If the belt is too loose and comes off or too tight and wears through, it will cause the electrical system to malfunction. This could occur during an outing and strand the boaters. Therefore, take this maintenance function very seriously.

- The serpentine belt is located on the front of the engine, except in V-drive boats where it will be at the back due to the manner in which the engine is mounted in the boat.
- Using a 15mm socket wrench, remove tension from the belt by moving the tensioner to its maximum travel position.
- Remove the serpentine belt by unwrapping it from each of the pulleys.
- Check the wear on the inside grooves. If this is part of the annual maintenance, most likely the serpentine belt will need to be replaced.
- To install a new belt or to reinstall the existing belt, wrap the belt around the pulleys as shown, and use a 15mm socket to rotate the tensioner to its maximum travel. This should allow enough slack to slide the belt over the smooth, water pump pulley.
- Ease the tensioner back into place and ensure that the belt is properly wrapped around all of the pulleys.
- Check that the belt has the proper give.

Locate the engine coolant heat exchanger. It is installed vertically near the front of the engine either next to the serpentine belt (5.7L) or in front of the serpentine belt (6.0L).

Using an 11/16" socket wrench, remove the zinc anode from the lower end of the heat exchanger.

Inspect the anode for wear, if the anode exhibits signs of excess wear or has reduced to half of its original size it will need to be replaced.

Replacing the Zinc Anodes (Saltwater Applications)

Cleaning Engine Compartment and Corrosion Prevention

The engine compartment should receive a good, general cleaning of the interior as well as the engine and transmission exteriors. There is reward in the cleaning beyond enhancing the overall value of the boat. Cleaning with simple soap and water can reveal if any corrosion has occurred during the previous season's operation, and establishes a baseline for the next season.

Corrosion can occur in any type of water and on any metal surface, even when the type of metal such as stainless steel, has been chosen for components. But corrosion is of particular concern for boats that will be operated in salt water, even if the system is closed cooling. Salt water may still enter the engine compartment due to the engine compartment cover being open to vent carbon monoxide and prevent explosive fumes. The exhaust system will always be subject to contact with salt water in these conditions, too.

Galvanic corrosion, or electrolysis, is the decomposition of metal due to the effects of electrolytic action. When two (2) dissimilar metals are immersed in a conductive fluid such as salt water, an electric current is produced, much like the action of a battery. As the current flows, it takes with it tiny bits of the softer metal. If left unchecked, severe damage may occur over time.

A boat properly prepared for operation in salt water will have self-sacrificing zinc anodes mounted on the transom, and possibly elsewhere underwater. These anodes are intended to reduce the effects of galvanic corrosion to critical metal areas of the boat. The zinc anodes should be checked regularly, and when significant erosion is shown, the anodes should be replaced. More information regarding the zinc anodes is contained in the boat manufacturer's Owner's Manual.

CAUTION

Exposure to salt water causes corrosion, leading to significant damage to metal, including stainless steel and chrome. If evidence of corrosion shows on the boat, the engine and transmission should be carefully cleaned with fresh water and a mild soap solution after use in salt water. A protective marine oil may be applied to exposure metal to halt the acceleration of corrosion. Failure to pay attention to corrosion matters will void the warranty.

Engine Tune-Up

A complete engine tune-up needs to be done at least every 300 hours or annually, whichever comes first. This includes but is not limited to: replacement of the spark plugs and spark plug wires (if needed), a check of the installed distributor position and shaft alignment, as well as cleaning the breather hose. ILMOR strongly recommends having the engine tune-up performed by an authorized ILMOR dealer.

STORAGE & WINTERIZATION

Proper storage and/or winterization preparations are as important as how a drive train is maintained in use. Since special preparations are necessary, the boat owner should have the work done by an ILMOR-authorized dealer. Damage that occurs from improper storage and/or winterization is not covered under warranty and must be avoided.

Engine winterization requires adding a fuel stabilizer and biocide to the fuel tank/system, changing the engine oil/filter, draining all raw water from the cooling system, and adding marine/RV anti-freeze to all raw water engine components.

CAUTION

Damage due to improper storage and/or winterization preparations is not covered under warranty. Owners are encouraged to seek assistance from an authorized ILMOR dealer to properly prepare the drive train for periods of inactivity exceeding two (2) weeks.

Fuel System Treatment

This preparation needs to be done prior to removing water from the engine, if that will be part of the process.

Boats that are going to be stored for extended periods (more than two [2] weeks) or winterized should have attention for the fuel system. Even TOP TIER gasolines will experience some separation of elements and settling during these periods. Of considerable concern is that water condensation will occur within the fuel system, and water is an enemy of good-starting and running engine fuel systems. Therefore, follow this procedure:

• The fuel tank should be ninety-to-ninety-five percent (90-95%) full of TOP TIER gasoline. This allows for minimal room in which air can oxygenate the fuel during diurnal cycles (daily periods of expansion/contraction of gasoline vapors and air as a result of temperature changes). As temperatures rise in the tank, the pressure also rise, pushing out gasoline vapor-and-air mixtures. When the temperature falls, pressure lowers and the system will seek to draw fresh air and water vapor (depending on the humidity level) into the tank. Fresh air is replaced with "light ends," which are low-boiling components that vaporize at ambient temperatures. Light ends are required during cold starts to vaporize the fuel. Since the daily diurnal cycles eliminate the light ends, a nearly full tank helps to minimize the air volume entering the system.

- Add a biocide additive such as Valvetect Bioguard™ Fuel Biocide in the fuel tank to limit microbial growth in gasoline. Follow the directions provided by the stabilizer's manufacturer.

- Add a fuel stabilizer, such as Sta-Bil®, to the fuel tank. Follow the directions provided by the stabilizer's manufacturer.

- Run the engine for at least fifteen (15) minutes while in a body of water. This allows for the circulation of the additives throughout the fuel system.

- If possible during storage, the tank vents should be sealed. If the vent is sealed, the tank must NOT be completely filled. A ninety-to-ninety-five percent (90-95%) filled tank allows room for expansion, which will be required at certain times when temperatures increase. The hydrocarbons in gasoline react with naturally occurring oxygen and create a by-product known as "gum."The substance, as the name infers, plugs up fuel filters and injectors. Sealing the tank helps reduce gumming by significantly limiting the amount of oxygen available for interaction with the hydrocarbons.

Completely filling the fuel tank prior to storage and then sealing the fuel tank vent does not allow room for necessary expansion. This can result, in extreme conditions, in fuel tank rupture. Such release of fuel into the boat and potentially into the storage area could result in substantial damage to the boat and contact with any spark (such as a flame-producing pilot light in a heater) could also result in property damage and serious injury or death.

WARNING

It is desirable to keep the fuel's temperature below 80 F. (26 C.) The gumming will increase as temperatures increase.

Note that fuel stabilizers work ONLY in fresh gasoline. Stabilizers will not cure oxygenated gasoline. Adding a stabilizer when the boat is being prepared for outings after storage will NOT clean the gumming that has occurred or remove water from the fuel tank or otherwise eliminate any problems that have occurred due to failure to properly prepare the fueling system for storage.

ILMOR suggests using Federal or State of California (TOP TIER) reformulated gasoline whenever possible as it stores as well or better than conventional gasoline.

Even quality gasoline that has been properly prepared for storage should never be stored for a period to exceed one (1) year.

Fuel systems on all boats equipped with ILMOR MV-8 engines MUST be properly prepared for storage periods exceeding two (2) weeks, as outlined in this Owner's Manual. Failure to do so will void the warranty.

CAUTION

Oil Storage/ Winterization

Contaminants in used oil can cause engine damage during storage. Perform an oil change and run engine to operating temperature to allow new oil recirculation.

Cooling System Storage and Winterization

Cooling system storage/winterization requires draining and flushing raw water components with Marine/RV Antifreeze. Engines with closed cooling systems using ILMOR 50/50 propylene glycol/water mix **DO NOT REQUIRE DRAINING**. The ILMOR 50/50 coolant will provide freeze protection down to -26 F. (-32 C.) All components which raw water flows through must be drained. The following steps are recommended for draining of raw water components:

Method 1
Engine Off

- Drain exhaust manifolds of raw water by removing ½" NPT pipe plugs.

- Drain engine block of raw water (if raw water cooled).
  - For 5.7L applications: remove knock sensors/drain plugs from both sides of the engine block.
  - For 6.0L, 6.2L and 7.4L applications: Remove drain plugs from both sides of engine drain hoses, drain fitting #6SS - part number 94MV8-1476; removal of drain plugs will require both an 11/16" and 5/8" size wrench.

- Drain heat exchangers of raw water.
  - Open cooled systems will have an oil/transmission heat exchanger.
    - Remove 1/8" NPT drain plug and allow draining.
  - Closed cooled systems will have an oil/transmission and engine heat exchanger.
    - Remove 1/8" NPT drain plug and allow draining.

- Reinstall exhaust header drain plugs, engine block drain plugs, and heat exchanger end caps/drain plugs after all raw water has been drained. Drain other components that contain raw water, such as the water heater.

- Fill all components of raw water system with a non-toxic -50 F. (-45 C.), -60 F. (-51 C.) or -100 F. (-73 C.) Marine/RV Antifreeze. Freeze protection level will depend on climate location. ***Marine/RV Antifreeze will provide freeze protection to water pockets that did not drain and necessary corrosion protection.*** Approximately six (6) gallons of Marine/RV Antifreeze will be needed for open cooled systems. Approximately three (3) gallons will be needed for closed cooled systems. There are two methods for filling your engine with antifreeze;

  - **Open Cooled System**
    - Close thru-hull water pick up sea cock.
    - Fill engine block and heads from thermostat housing. Remove both exhaust header feed hoses. Lift either the port or starboard hose as high as possible and fill until full. The other removed hose allows air to purge.
    - Fill port and starboard exhaust manifolds by removing thermostat hose ends. Lift hose end as high as possible and fill until full.
    - Fill sea strainer if not full.

  - **Closed Cooled System**
    - Close thru-hull water pick up sea cock.
    - Fill raw water components by removing both one-inch (1") hoses from exhaust downturn adapters. Lift either the port or starboard hose as high as possible and fill until full. This should fill the raw water side of the engine heat exchanger, oil/transmission heat exchanger, raw water pump, and sea strainer. The sea strainer may need to be opened to purge air.
    - Fill sea strainer if not full by end of procedure.
    - Fill down turn exhaust adapters with 1/4 to 1/2 gallons of antifreeze.
    - Reinstall hoses.

Method 2
Engine On

- Remove the engine thermostat. If it is not removed, the antifreeze will pump through the exhaust adapters and bypass the engine.
- Fill a bucket with four (4) gallons of non-toxic marine/RV antifreeze. Do not dilute it. It comes pre-diluted. Add remaining 2 gallons of antifreeze during procedure.
- Using an inboard engine flush system or Fake-a-Lake kit and a short garden hose, put one end of the hose in the antifreeze bucket and the other end attached to the inboard engine flush system.
- Place a five (5) gallon bucket under each exhaust port to catch any antifreeze that comes out.
- Start engine and run until six (6) gallons of antifreeze is pumped into the engine. This should take approximately one (1) minute. If the sea pump can not pump the fluid, check that all connections are tight. If this still does not work, close off the thru-hull sea cock and pour antifreeze into the sea strainer. Allow the engine to suck the antifreeze out of the sea strainer.
- Keep moisture out of the exhaust system by taping the exhaust outlets closed.

Engine Fogging Oil

Fogging oil helps protect internal engine components from corrosion during long periods of in-operation. Marine engine foggers come in aerosol cans labeled "engine fogging oil." It is recommended to use STA-BIL® Engine Fogging Oil.

1. Remove the engine air filter.
2. Start engine and allow idling.
3. Spray fogging oil into throttle body until engine begins to choke and then immediately shut engine off. Do not allow engine to stall as this will leave the spark plugs fouled and make it difficult for restarting after storage. If the engine stalls, restart and re-do the procedure. Some engine throttle may be required to get adequate engine fogging oil in.
4. Reinstall engine air filter.

Battery Winterization

Disconnect the battery(ies) and fully charge. It is recommended to take the battery out of the boat and store it inside. If the battery loses charge it has the risk of being damaged due to freezing.

Check the battery manufacturer's requirements. Some may indicate that the battery should not be stored on a concrete surface. Check to make sure battery is charged every 30-45 days. Slow charge using a trickle charger if necessary.

Recommissioning After Storage/Winterization

Properly preparing the engine and drive train after a period of storage and/or winterization is equally important. Equal attention must be paid to the same components during recommissioning as during the winterization process.

1. Remove raw water pump impeller and check it carefully. If it appears to have weathered or there are any doubts about its ability to function properly, replace it. See the instructions for correctly installing a raw water impeller in the *Maintenance* section of this Owner's Manual. The raw water impeller should be replaced once a year or at any time during routine maintenance that it shows wear.
2. Check all fluids; oil, transmission, cooling.
3. Reinstall battery(ies) and check the battery voltage. It should be 12V –14volts. If it is less, charge the battery(ies).
4. Visually inspect the fuel system. If there appears to have been undue weathering or any leaks have appeared over the storage/winterization period, contact your authorized ILMOR dealer for correction. DO NOT start the engine if there is any appearance of leakage or rupture of any component of the fuel system.
5. Install boat hull drain plugs.
6. Marine/RV Antifreeze should be drained and recycled. It is best accomplished by running the boat on the garden hose and collecting the antifreeze into buckets as it comes out of the exhaust.
7. Review the boat manufacturer's storage and winterization recommissioning directions to ensure that all requirements have been met, prior to launching the boat.

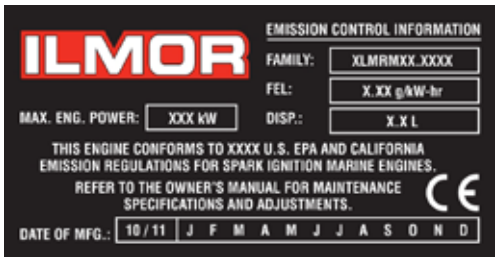
EMISSIONS

It is extremely important that attention be given to the emissions throughout the life of the engine. It is the owner/operator's responsibility to ensure that the engine maintenance is performed as described in this Owner's Manual, in order to maintain emissions levels within the certified standards. The owner/operator(s) must never modify the engine in any manner that alters the allowable emission levels to exceed the certified specifications.

EMISSIONS CONTROL INFORMATION LABEL

At the time of manufacture, each engine is affixed with a tamper-resistant Emission Control Information label. This label affirms the required emissions statement, along with the engine "family," as well as the engine displacement. The engine serial number and the date of manufacture are stamped on a flat boss near the cylinder heads. Boat builders and dealers are not allowed to remove prior to sale the label or the parts to which the labels are affixed. If replacement decals are needed, contact ILMOR Marine, LLC, prior to sale.

Engines with the CE mark present in the lower right corner of the Emission Control Information Label affirm that the Declaration of Conformance applies. The Declaration of Conformity attests the engine's conformance to the appropriate European Community Directive. The Emission Control Information Label is located on the electrical bracket on the rear of the engine.


ILMOR
EMISSION CONTROL INFORMATION
FAMILY: XLMRMXX.XXXX
FEL: X.XX g/kW-hr
MAX. ENG. POWER: XXX kW
DISP.: X.X L
THIS ENGINE CONFORMS TO XXXX U.S. EPA AND CALIFORNIA EMISSION REGULATIONS FOR SPARK IGNITION MARINE ENGINES.
REFER TO THE OWNER'S MANUAL FOR MAINTENANCE SPECIFICATIONS AND ADJUSTMENTS.
CE
DATE OF MFG.: 10/11 J F M A M J J A S O N D

EMISSIONS CONTROL SYSTEM INFORMATION

The emission control system information for all engines having the Emission Control Information Label are as follows: three way catalytic converter (TWC), heated oxygen sensors (HO2S), sequential multiport fuel injection (SFI), naturally aspirated (NAT), On-Board Diagnostics Marine (OBD), low-permeation fuel line (HOSE), and electronic engine control (EC).

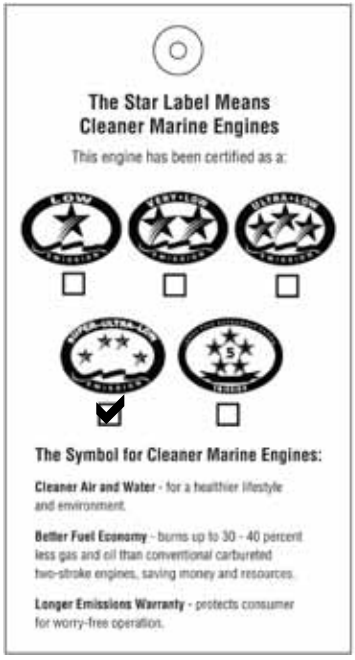
STAR LABEL

Beginning January 1, 2009, a Four Star label is placed on the hull by MasterCraft for each certified ILMOR Marine, LLC, engine. For any boat sold or registered in California, the Four Star label must be affixed to the port side of the hull either forward or aft of the vessel registration as shown in the illustration below.

An ILMOR MV8 engine has a Four Star – Super Ultra Low Emission rating. This indicates that the engines have ninety percent (90%) lower emissions than One Star – Low Emissions engines. The Four Star label identifies these engines as meeting the California Air Resources Board's sterndrive/inboard marine engine exhaust emission standards. This label is also located on the port side of the intake manifold.

HANG TAG

Each boat equipped with an ILMOR MV8 engine will have a hang tag with the Four Star box check-marked. It is the responsibility of the selling dealer to include the hang tag, and it must be marked in the correct box to match the Four Star label on the engine and the boat. The dealer must display the hang tag in a visible location on the boat prior to displaying the boat for sale in California. If only the engine is displayed, a hang tag must still be placed in a visible location on the engine. Failure to correctly display the hang tag may result in a citation and possible fine to the dealer. These are issued by the California Air Resources Board.


The Star Label Means
Cleaner Marine Engines
This engine has been certified as a:
The Symbol for Cleaner Marine Engines:
Cleaner Air and Water - for a healthier lifestyle and environment.
Better Fuel Economy - burns up to 30 - 40 percent less gas and oil than conventional carbureted two-stroke engines, saving money and resources.
Longer Emissions Warranty - protects consumer for worry-free operation.

ON-BOARD DIAGNOSTICS-MARINE (OBD-M)

All ILMOR MV8 engines are equipped with marine on-board diagnostics to comply with the 2009 California-mandated OBD-M diagnostic specification. The Malfunction Indicator Lamp (MIL) or a Check Engine warning will appear on the dash when emission system problems occur on the boat.

If the MIL is set due to an emissions-related fault, a Diagnostic Trouble Code (DTC) will set. The MIL functions to notify the operator that a problem has occurred so that the owner/operator can arrange for service as soon as possible, and also to display DTCs that have been stored. This information about system malfunction assists the service technician in quickly diagnosing system issues. When the MIL lights, the owner/operator should contact an authorized ILMOR deal to arrange a diagnostic scan at the earliest possible opportunity.

DTCs are stored in the engine control unit memory and can be retrieved with an ILMOR Marine version scan tool or through Diacom PC Software. That is why it is necessary to seek assistance from the appropriate dealer.

The Diagnostic Scan Tool will be connected to the Data Link Connector (DLC); a flat 6-pin connector. The connector is located on the port forward section of the intake manifold and is usually marked with either DLC or Data Link Connector just behind the plug. Note that the protective DLC cover must be removed prior to connecting the Scan Tool.

CALIFORNIA AND U.S. EPA EMISSION CONTROL WARRANTY STATEMENT

California and U.S. EPA Emission Control Warranty Statement

YOUR WARRANTY RIGHTS AND OBLIGATIONS

Your Warranty Rights and Obligations

The California Air Resources Board, U.S. Environmental Protection Agency and ILMOR Marine, LLC are pleased to explain the emission control system warranty on your 2011 sterndrive/inboard engine. In the United States, new sterndrive/inboard engines must be designed, built and equipped to meet all Federally mandated anti-smog standards. ILMOR Marine, LLC must warrant the emission control system on your sterndrive/inboard engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your sterndrive/inboard engine.

Your emission control system may include parts such as the fuel injection system, the ignition system, and catalytic converter. Also included may be hoses, belts, connectors and other emission-related assemblies.

Where a warrantable condition exists, ILMOR Marine, LLC will repair your sterndrive/inboard engine at no cost to you, including diagnosis, parts and labor.

MANUFACTURER'S WARRANTY COVERAGE:

Manufacturer's Warranty Coverage

Select electronic emission-related control parts from model year 2009 and later sterndrive/inboard engines are warranted for 3 years or 480 hours, whichever first occurs.

Select mechanical emission-related components are warranted for 3 years or 480 hours of operation, whichever first occurs, for engines with maximum power less than or equal to 373 kW (500 bhp); or 3 years or 150 hours of operation, whichever first occurs, for engines with maximum power greater than 373 kW (500 bhp) but less than or equal to 485 kW (650 bhp).

However, warranty coverage based on the hourly period is only permitted for engines that are equipped with hour meters as defined in § 2441(a)(13) or their equivalent. If any emission-related part on your engine is defective under warranty, the part will be repaired or replaced by ILMOR Marine, LLC.

OWNER'S WARRANTY RESPONSIBILITIES:

Owner's Warranty Responsibilities

- As the sterndrive/inboard engine owner, you are responsible for the performance of the required maintenance listed in your owner's manual. ILMOR Marine, LLC recommends that you retain all receipts covering maintenance on your sterndrive/inboard engine, but ILMOR Marine, LLC cannot deny warranty solely for the lack of receipts or your failure to ensure the performance of all scheduled maintenance.

- As the sterndrive/inboard engine owner, you should however be aware that ILMOR Marine, LLC may deny you warranty coverage if your sterndrive/inboard engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

- You are responsible for presenting your sterndrive/inboard engine to an ILMOR Marine, LLC authorized service center as soon as a problem exists. The warranty repairs will be completed in a reasonable amount of time, not to exceed 30 days.

If you have any questions regarding your warranty rights and responsibilities, you should contact ILMOR Marine, LLC at 1-704-360-1900.

GENERAL EMISSIONS WARRANTY COVERAGE

General Emissions Warranty Coverage

ILMOR Marine, LLC must warrant that the engine is:

(1) Designed, built and equipped so as to conform with all applicable regulations adopted by the Air Resources Board pursuant to its authority in Chapters 1 and 2, Part 5, Division 26 of the Health and Safety Code, and by the U.S. Environmental Protection Agency pursuant to 40 CFR 1045; and

(2) Free from defects in materials and workmanship that cause the failure of a warranted part to be identical in all material respects to that part as described in the engine manufacturer's application for certification.

Emission Control System Warranty Parts

Exclusions:

Failures other than those resulting from defects in material or workmanship are not covered by this warranty. This warranty does not cover damage to emission control systems or parts which are a result of owner abuse, neglect, improper maintenance, the incorporation of, or use of, add on or modified parts, or the unapproved modification of any part.

This warranty does not cover replacement of expendable maintenance items made in connection with required maintenance service as listed in the maintenance section of the product Owner's Manual, examples of which include: spark plugs, filters, and belts. If a part is repaired or replaced under this warranty, the life of the warranty is not extended beyond its original expiration date.

Disclaimer:

This warranty is applicable only where the California and U.S. EPA emission control system warranty regulation is in effect. The use of add-on(s) or modified parts not exempted by the California Air Resources Board or the U.S. EPA may be reason for not warranting a claim, at the discretion of ILMOR Marine, LLC. In the case of non-exempted add-on(s) or modified part(s) causing failure to a warranted part, the warranted part will not be covered.

Emission Control System Warranty Parts:

ILMOR Marine, LLC will warranty select emission control parts for 3 years or 480 hours, whichever first occurs. For the MV8 7.4L engine only: Select mechanical emission-related components will be warranted for 3 years or 150 hours, whichever first occurs.

Mechanical Emission-Related Components Warranty:

Systems Covered by this Warranty:	Parts Description:
Fuel Metering	Intake valves Pressure regulator (7.4L only)
Air Induction	Intake manifold Air filter*
Ignition	Spark plugs* Ignition coil(s) Ignition wires
Lubrication	Oil pump (includes internal parts)
Crankcase Ventilation System	PCV pipe Fresh air pipe PCV hose connector Valve cover grommet Oil filler cap
Exhaust / Catalyst System	Exhaust manifold (tailpipe not included) Exhaust valve(s) Catalytic converter
Evaporative	Low-permeation hose(s)** Carbon canister (7.4L only) Fuel tank (7.4L only)
Miscellaneous Items	Hoses Clamps Fittings Tubing Sealing gaskets or devices Mounting hardware Pulleys Belts*

* Covered up to but not including the first required replacement only. See the Maintenance Schedule in the Owner's Manual.

** MV8 5.7L only

Electronic Emission-Related Control Parts Warranty:

Systems Covered by this Warranty:	**Parts Description:**
Fuel Metering	Fuel injectors
Ignition	Air/fuel ratio feedback and control system Cold start enrichment system Electronic ignition system
Miscellaneous Items	Spark advance/retard system Camshaft position sensor
*** MV8 6.0L only	Crankshaft position sensor Engine coolant temperature sensor Intake air temperature sensor Knock sensors Manifold absolute pressure sensor Throttle position sensors Electronic Control Unit Electronic Throttle Control Camshaft position (CMP) actuator solenoid valve*** Oil Pressure Sensor***

TROUBLESHOOTING

The following chart is offered as assistance in identifying and correcting minor issues that may occur. Problems are listed in the order of most-likely to least-likely. Not all possible problems, causes and solutions can be listed here.

When experiencing problems, check surroundings before shutting down the engine. If suddenly stopping the power would result in placing other boats and boaters in jeopardy, continue until it is safe(r) to slow or stop and analyze the situation. Always be aware of surroundings and how your actions may impact others!

Problem	Possible Cause	Potential Solution
Engine will not turn over.	Safety switch tether not connected.	Connect the safety switch tether.
	Throttle/shift control in gear.	Shift to neutral.
	Main circuit breaker open.	Re-set the circuit breaker.
	Battery terminal corroded.	Clean the battery terminals.
	Battery weak or worn out.	Charge or replace the battery.
	Loose or corroded battery wiring connectors.	Clean and tighten the battery wiring connectors.
	Defective starter solenoid.	Replace the starter solenoid.
	Defective neutral safety switch.	Replace the neutral safety switch.
	Defective starter motor.	Replace the starter motor.
Engine turns over, but will not start.	Safety switch tether not connected.	Connect the safety switch tether.
	No fuel in the tank.	Fill the fuel tank.
	Fuel filter clogged.	Have dealer replace the fuel filter.
	Contaminated fuel.	Drain fuel properly and have dealer replace the filter.
	Weak or shorted ignition coil.	Replace the ignition coil.
	No fuel to the engine.	See authorized ILMOR dealer.
Engine misses or idles rough.	Fouled spark plugs.	Have dealer replace the spark plugs.
	Loose or defective high-tension leads.	Have dealer tighten or replace the high-tension leads.
	Plugged PCV valve.	Have dealer replace the PCV valve.
	Weak ignition coil.	Have dealer replace the ignition coil.
	Vacuum leak.	See authorized ILMOR dealer.
Poor boat performance.	Fouled spark plugs.	Have dealer replace the spark plugs.
	Contaminated fuel.	Drain fuel properly and have dealer replace the filter.
	Plugged flame arrestor.	Clean the flame arrestor.
	Weak ignition coil.	Have dealer replace the ignition coil.
	Fuel filter clogged.	Have dealer replace the fuel filter.
	Ignition problems.	See authorized ILMOR dealer.
Poor gas mileage.	Fouled spark plugs.	Have dealer replace the spark plugs.
	Plugged flame arrestor.	Clean the flame arrestor.
	Inefficient driving habits.	Plane the boat quickly, then slow down to desired speed.
	Plugged PCV valve.	Have dealer replace the PCV valve.
	Ignition problems.	See authorized ILMOR dealer.

ILMOR MARINE, LLC
LIMITED PRODUCT WARRANTY

1. **General.** ILMOR Marine, LLC ("ILMOR Marine") provides this limited warranty to customers purchasing a MasterCraft ski or wakeboard boat equipped with an ILMOR Marine engine and power train system (the "ILMOR Products"). This warranty may be transferred to a second retail purchaser for only the unused portion of the warranty. ILMOR Marine must be notified in writing at the time the second purchaser takes possession. Notice must be sent to: ILMOR Marine, LLC, 186 Penske Way, Mooresville, NC 28115, Attn: Warranty Department within fifteen (15) days after the second sale. At the time of warranty transfer, ILMOR may require an inspection of the ILMOR Products at an authorized MasterCraft dealer service center, at the second purchaser's expense, to verify the condition of the ILMOR Products. If any ILMOR Products cannot pass inspection, ILMOR Marine may reject the transfer of this warranty. Any approved transfer of the warranty will not extend the warranty term.

2. **Warranty.** Subject to all terms of this Limited Product Warranty, ILMOR Marine represents that the ILMOR Products will conform to published ILMOR Product Specifications and be free from defects in material and workmanship under normal use and service during the warranty period set forth herein.

3. **Warranty Term.** The term of ILMOR Marine's limited warranty is thirty-six (36) months. The warranty begins upon the date of delivery of the MasterCraft ski or wakeboard boat installed with ILMOR Products to the original retail purchaser of that boat. In the event that the MasterCraft ski or wakeboard boat is purchased used from a MasterCraft Dealer as a demonstrator or boat show display, this warranty begins at the earlier of the date of delivery or such time as the boat installed with the ILMOR Products attains more than one-hundred hours of use (regardless of the source of such use).

4. **Warranty Exclusions.** This warranty shall not apply to defects or damages to the ILMOR Products as a result of use for a purpose or in a manner for which they were not intended, which are altered in any way, which are not maintained in accordance with ILMOR Marine recommended maintenance requirements or procedures or which are subject to misuse, negligence, accident or neglect, or unreasonable exposure to the environment, so as to affect adversely the condition, performance or value of such items. ILMOR reserves the right to retrieve data from the ILMOR Products En-

gine Control Module prior to granting warranty coverage and in determining warranty eligibility. This warranty shall only apply to ILMOR Products purchased with and installed in MasterCraft ski and wakeboard boats. In addition, the warranties shall not apply to defects or damages to the ILMOR Products as a result of:

(a) Routine maintenance items, tune ups, adjustments, normal wear and tear, damage caused by abuse, abnormal use, or failure to comply with requirements or specifications with regard to installation, maintenance, startup, break-in, operation and safety, both at the time of delivery and thereafter;

(b) Neglect, accident, improper installation, improper service, use of an engine transmission or other powertrain accessory or engine, transmission or other powertrain part not manufactured or sold by ILMOR, operation with fuels, oils, lubricants or filtration systems which are not suitable for use with the product or alteration or removal of parts or components;

(c) Use of the ILMOR Products with any product, component or part incorporated into the ILMOR Products that is not manufactured by ILMOR or provided for in ILMOR Product Specifications, including the use of non-ILMOR specified service parts, unless such modification or use of parts is requested and approved in advance by ILMOR in writing;

(d) Engine, transmission or other powertrain repair or service by a dealer not approved or authorized by OEM;

(e) Damage due to abuse, negligence, misuse, mishandling, the use of improper, poor quality or contaminated fuel or lack of or dilution of lubricants or fluids or other operating conditions, including causing excessive wear due to uses for which the products were not originally designed;

(f) Incidental and consequential damages, including, but not limited to, storage charges, rental charges, inconvenience, loss of time or use, or loss of income. Some states do not allow the exclusion or limitation of incidental or consequential damage, so the above limitation or exclusion may not apply to you;

(g) Water pump impellers, water hoses, cooling system anodes or any component determined by ILMOR to be a result of failure of such items;

(h) Cost of transporting ILMOR Products or the vessel in which such products are installed to and from designated service facilities for warranty repair and other haul out, launch or towing charges;

(i) Oils, lubricants, fuels, or fluids used for normal maintenance and shop supplies such as filtration systems;

(j) Defects to the starter motor, armatures, or field coil assembly determined by ILMOR to be caused by excessive cranking, condensation or submersion;

(k) Defects due to water entering the ILMOR Products through the intake or exhaust system or as a result of submersion or lack of cooling resulting from engine starting outside of the water or with foreign materials blocking intake passages;

(l) Any other damages to ILMOR Products which ILMOR Marine, in its sole discretion, determines are not the result of defects in ILMOR Products material and workmanship;

(m) Damage resulting from running aground;

(n) Damage resulting from sand, debris or any foreign material being drawn into the water pump and components;

(o) Costs that are related to changing gear ratios and/or the modification of any other system to meet altitude requirements or the changing of sacrificial anodes and/or cooling system content when transferring vessels between fresh and salt water operations; and

(p) Travel to or from the product by servicing dealer or the transportation costs of the product to and from the servicing dealer; any charges for towing, haul-out, launch, storage, fuel or lubricant usage, premium freight charges; any excessive time for removal of boat partitions, hatches, decks to gain necessary service access to engine, transmission, or other powertrain part or component; or, any subsequent expenses resulting from the loss of the use of the vessel or its components, loss of income, or inconvenience.

5. **Warranty Procedure.** Within ten (10) days from the date of purchase by the original purchaser of a MasterCraft ski or wakeboard boat containing ILMOR Products, the purchaser shall be required to (i) complete and mail to ILMOR, an ILMOR Marine Warranty Registration Card; or (ii) complete the on-line warranty registration at the ILMOR Marine web site (www.ILMORmarine.com/warrantyregistration). Warranty claims will not be processed, and are conditioned upon, registration of the purchase with ILMOR Marine. If you believe your ILMOR Products fail to perform in accordance with specifications, have defects in material or workmanship, or are otherwise eligible for coverage under ILMOR Marine's warranty, you must contact an authorized MasterCraft Dealer within thirty (30) days of discovering the alleged defect. Your MasterCraft Dealer will provide you with the location and contact information of the service facility where you should take your ILMOR Products for inspection and repair. You are solely responsible for transporting your ILMOR Products to the designated service facility. The MasterCraft Dealer may arrange for the necessary inspection and repair to be made on-site, at ILMOR Marine's sole discretion. For questions regarding warranty service or to obtain

information regarding warranty service or to obtain information regarding the nearest authorized MasterCraft dealer, please contact MasterCraft at the following address or telephone number:

MasterCraft Boat Company, LLC
Attention: Warranty/Customer Service Department
100 Cherokee Cove Drive
Vonore, Tennessee 37885
1-423-884-2221

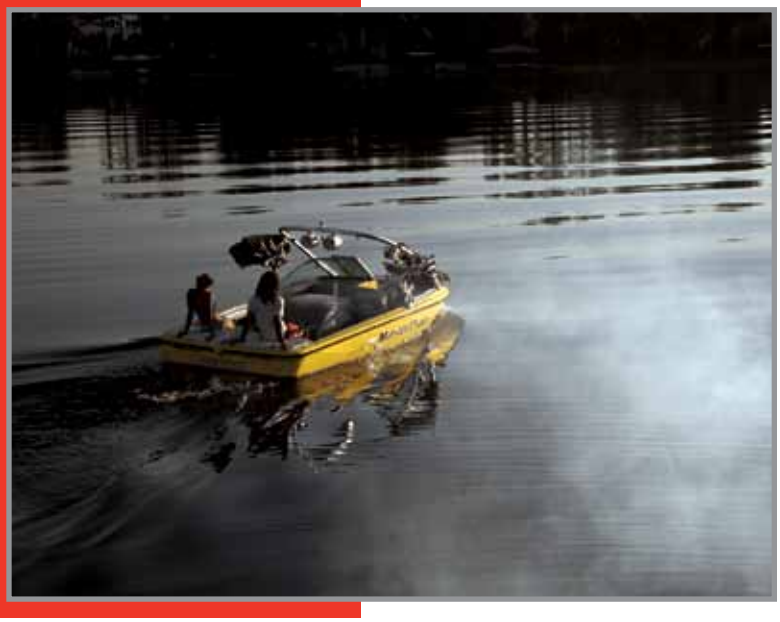
ILMOR Marine may repair or replace parts under this warranty with new, remanufactured or refurbished parts, in its sole discretion. Any replaced item under this warranty shall be the property of ILMOR Marine.

6. **Purchaser Responsibilities.** Purchasers of MasterCraft ski and wakeboard boats shall be responsible for:

- Performing regular maintenance and the costs associated with regular maintenance as specified in the applicable owners manual.
- Maintaining records of all recommended service and maintenance.
- Ordinary wear and tear.
- Any ILMOR Products that, in ILMOR Marine's sole judgment, has been used in racing or a contest of speed or endurance, used with non-approved accessories or attachments, or subject to accident, negligence, misuse, unreasonable exposure to the environment or service by an unauthorized facility.
- Consequences of any modification, alteration or tampering with any emissions or fuel limit adjustments.

7. **Warranty Limitations.**

THE WARRANTY STATED ABOVE IS A LIMITED WARRANTY AND IS THE ONLY EXPRESS WARRANTY MADE BY ILMOR MARINE WITH RESPECT TO THE ILMOR PRODUCTS. ALL IMPLIED WARRANTIES INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WILL EXPIRE WITH THE EXPIRATION OF THE LIMITED WARRANTY PROVIDED HEREUNDER. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.



UNLESS EXPRESSLY MODIFIED BY ILMOR MARINE IN WRITING, THIS LIMITED WARRANTY IS THE COMPLETE AND EXCLUSIVE AGREEMENT BETWEEN THE PARTIES WITH RESPECT TO WARRANTIES AND SUPERSEDES ALL PRIOR AGREEMENT, WRITTEN

AND ORAL, AND ANY OTHER COMMUNICATIONS RELATED TO WARRANTIES. NO PERSON OR ENTITY, INCLUDING MASTERCRAFT AND ITS DEALERS, IS AUTHORIZED TO GIVE ANY OTHER WARRANTY ON BEHALF OF ILMOR MARINE OR TO CREATE ANY OTHER OBLIGATION OF ILMOR MARINE WITH RESPECT TO THE ILMOR PRODUCTS.

NOTICE TO CALIFORNIA CUSTOMERS: CALIFORNIA CUSTOMERS MUST DIRECTLY NOTIFY ILMOR MARINE IN WRITING IF THE ILMOR PRODUCTS DO NOT CONFORM TO APPLICABLE WARRANTIES AND (A) THE NONCONFORMITY IS LIKELY TO CAUSE DEATH OR SERIOUS BODILY INJURY AND HAS BEEN SUBJECT TO REPAIR TWO (2) OR MORE TIMES, AND/OR (B) THE NONCONFORMITY HAS BEEN SUBJECT TO REPAIR FOUR (4) OR MORE TIMES. CALIFORNIA CUSTOMERS ARE HEREBY NOTIFIED OF THE FOLLOWING PROVISIONS OF CALIFORNIA LAW: CAL. CIVIL CODE SEC. 1793.22 AND CAL. CIVIL CODE SEC. 1793.2. COMPLETE COPIES OF THESE CODE SECTIONS ARE AVAILABLE UPON REQUEST.

CERTAIN OTHER LIMITED WARRANTIES MAY APPLY TO EMISSIONS UNDER CALIFORNIA AIR RESOURCES BOARD REGULATIONS. EMISSIONS RELATED WARRANTIES ARE SET FORTH IN THE OPERATORS MANUAL.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

SPECIFICATIONS AND SERVICE LOG

ENGINE SPECS

Engine Model	MV-8 5.7L	MV-8 6.0L	MV-8 6.2L	MV-8 7.4L
Number of Cylinders	V-8	V-8	V-8	V-8
Displacement	5.73L	5.978L	6.16L	7.4L
Compression Ratio	9.4:1	9.6:1	10.7:1	10.7:1
Valve Configuration	Overhead valves	Overhead valves	Overhead valves	Overhead valves
Firing Order	1-8-4-3-6-5-7-2	1-8-7-2-6-5-4-3	1-8-7-2-6-5-4-3	1-8-7-2-6-5-4-3
Fuel Type	Unleaded 87-93 octane	Unleaded 87-93 octane	Unleaded 87-93 octane	Unleaded 87-93 octane
Fuel Shutoff	5,200 RPM	5,400 RPM	5,400 RPM	5,800 RPM
Engine Weight (including V-drive)	1,012 lb (460 kg)	1,070 lb (486 kg)	940 lb (427 kg)	1,085 lb (472 kg)
MATERIALS				
Block	Cast Iron	Cast Iron	Cast Aluminum	Cast Iron
Cylinder Head	Cast Iron	Cast Aluminum	Cast Aluminum	Cast Aluminum
Intake Manifold	Aluminum Upper and Lower	Aluminum Upper and Lower	Aluminum Upper and Lower	Aluminum Upper and Lower
Exhaust Manifold	Cast Iron	Cast Iron	Cast Iron	Cast Iron

Requirements and Recommendations

Battery(ies) Recommended:

Spiral cell battery with minimum 750 cold cranking amps

Coolant in Half-Closed and Full-Closed Cooling System Required:

ILMOR Antifreeze

Engine Fogging Oil Recommended:

Sta-Bil® Fogging Oil

Flame arrestor:

94PE01163 (5.7L, 6.0L, 6.2L)

94PE01908 (7.4L)

Fuel Required:

Unleaded gasoline, 87 or higher octane, maximum of 10% alcohol

Fuel Recommended:

TOPTIER gasoline, 93 octane

Fuel System Stabilizer Recommended:

Sta-Bil®

Oil Required:

For 5.7L, 6.0L and 6.2L: ILMOR blended synthetic: SAE Grade 5W-30, Viscosity ASTM D445 ACEA Al/Bl, A5/B5; API SM, SL, SJ, EC, CF, CD; ILSAC GF-4 (5 qts. oil change); no oil additives; for 7.4L only: Synthetic 5W-50

Oil Filter:

94MV8V1021

RawWater Impeller Kit:

Open Cooled - 94MV8V1178

Closed Cooled - 94MV8V1179

Serpentine Belt:

5.7L - 94MV8V1034

6.0L, 6.2L, 7.4L - 94MV8V1044

Transmission:

Automatic transmission fluid

Transmission Filter:

Direct Drive (45A) - 94MV8V1173
Direct Drive (45C) - 94MV8V1174
Direct Drive (63A) - 94MV8V1176
V-Drive (63IV) - 94MV8V1175

Maintenance Requirements

Item	Service	First 25 hrs.	Every 50 hr.	Every 100 hr.	Every 300 hr/ Annually#	Every Two Years
Engine oil and filter	Change	X	X*			
Engine coolant	Change					X
Power steering fluid	Check					X
Transmission fluid	Change	X			X	
Serpentine belt	Inspect	X		X	X	
Raw water impeller/ sea pump	Inspect	X	X***		X***	
Air filter/flamer arrestor	Clean/ change			X		
Engine**	Tune-up				X	
Engine timing**	Check	X			X	
Spark plugs**	Replace				X	
Spark plug wires**	Inspect				X	
Breather hose**	Clean				X	
Shaft alignment	Check	X			X	
Heat exchanger(s)	Inspect/				X	
Zinc anodes	Clean Inspect		X			

#whichever comes first.

* If the engine is subject to heavy use, it is recommended to change oil and filter every 25 hours.

** Services best accomplished by an authorized ILMOR dealer.

***Replace sooner if regular checks indicate water or damage.

ILMOR recommends that the maintenance requirements be performed by an authorized ILMOR dealer. Service technicians there have the proper equipment, training and resources to best meet your service needs.

Transmission	Model	Ratio	Capacity	Fluid Type
V-drive	631V	1.56:1	4.6 qts. (4.4L) (1.1 U.S. gal)	Automatic transmission fluid (ATF)
Direct Drive	63A	1.22:1	4 quarts	Automatic transmission fluid (ATF)
Direct Drive	45A	1.26:1	2.65 quarts	Automatic transmission fluid (ATF)
Direct Drive	45C	1.00:1	3.2 quarts	Automatic transmission fluid (ATF)

Refer to the transmission manual for specific filter requirements.

SERVICE LOG

Service	Date	Date	Date	Date	Date	Date
Engine oil and filter						
Engine coolant						
Power steering fluid						
Transmission fluid						
Walters V-drive oil						
Serpentine belt						
Raw water impeller/ Sea pump						
Air filter/flame arrestor						
Engine*						
Engine timing*						
Spark plugs*						
Spark plug wires*						
Breather hose*						
PCV valve*						
Shaft alignment						
Heat exchanger(s)						
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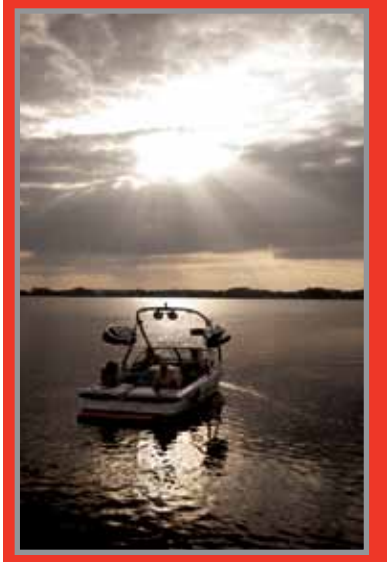

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